

# **Hurricane Information for Business Protection**

**Forecasts You Can Use to Make  
Smart Decisions**

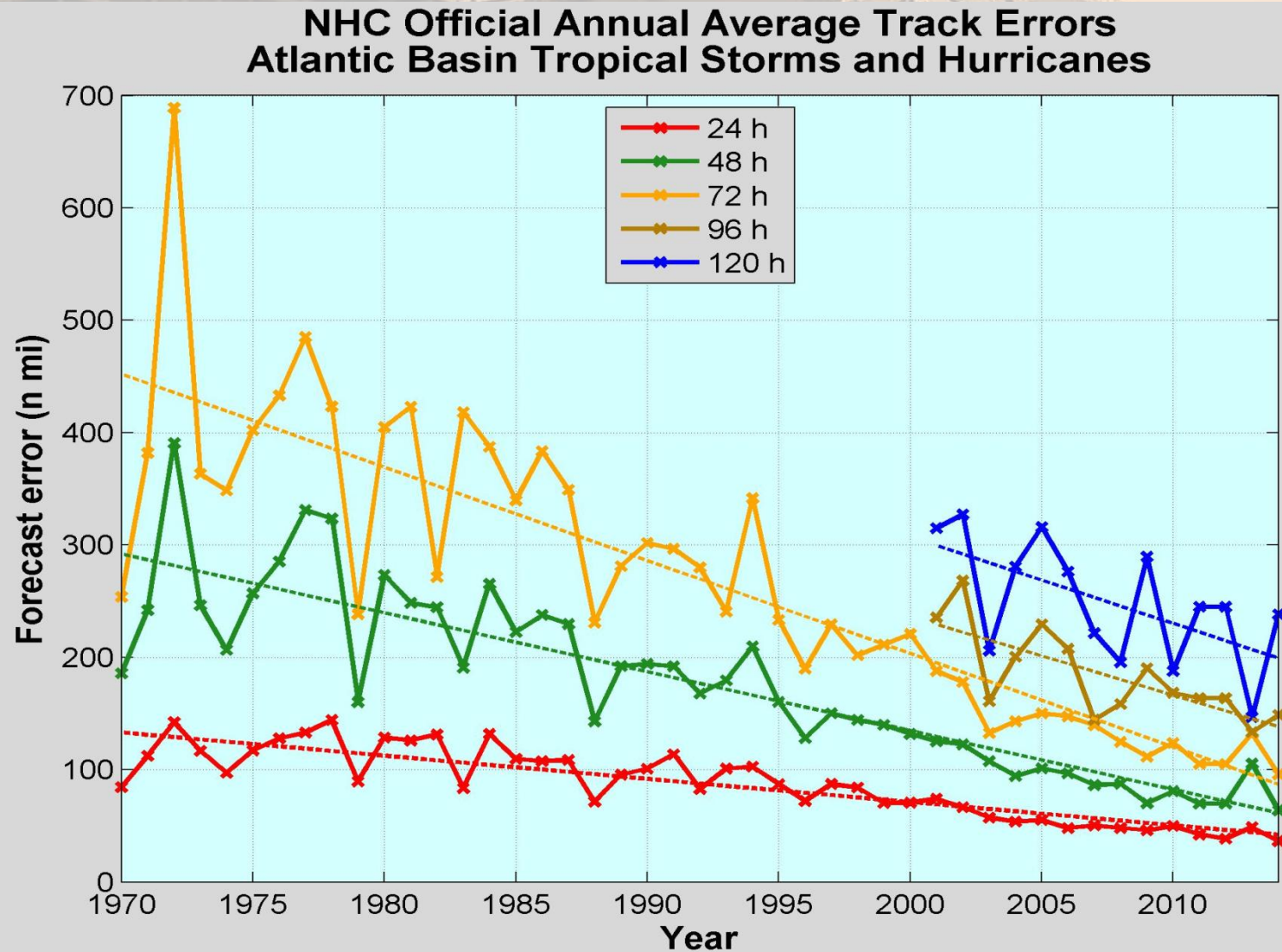
**Barry Goldsmith**

**NWS Brownsville/Rio Grande Valley**



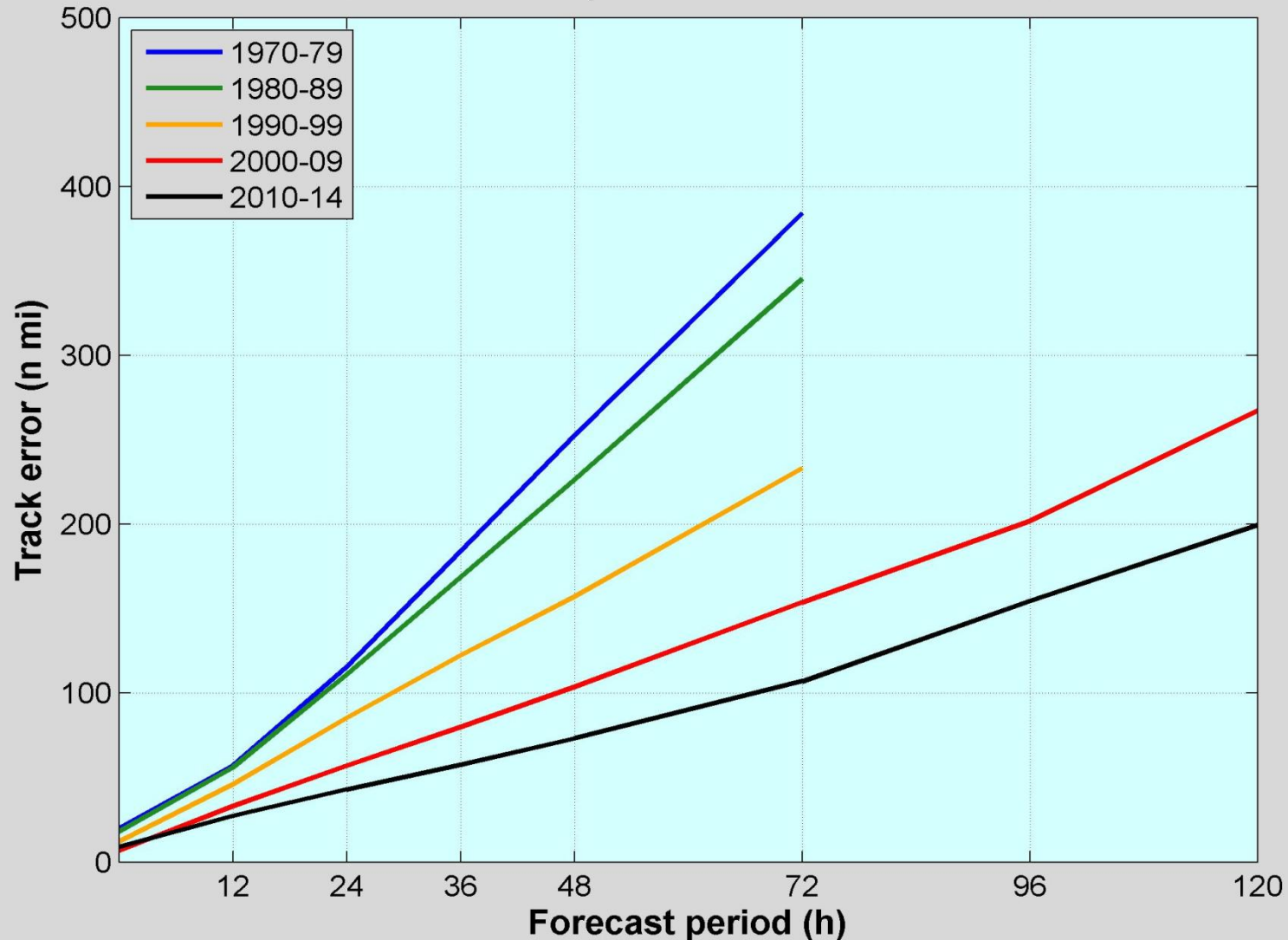
**Weather-Ready Nation**  
National Oceanic and Atmospheric Administration

# First Things: Better Forecasts

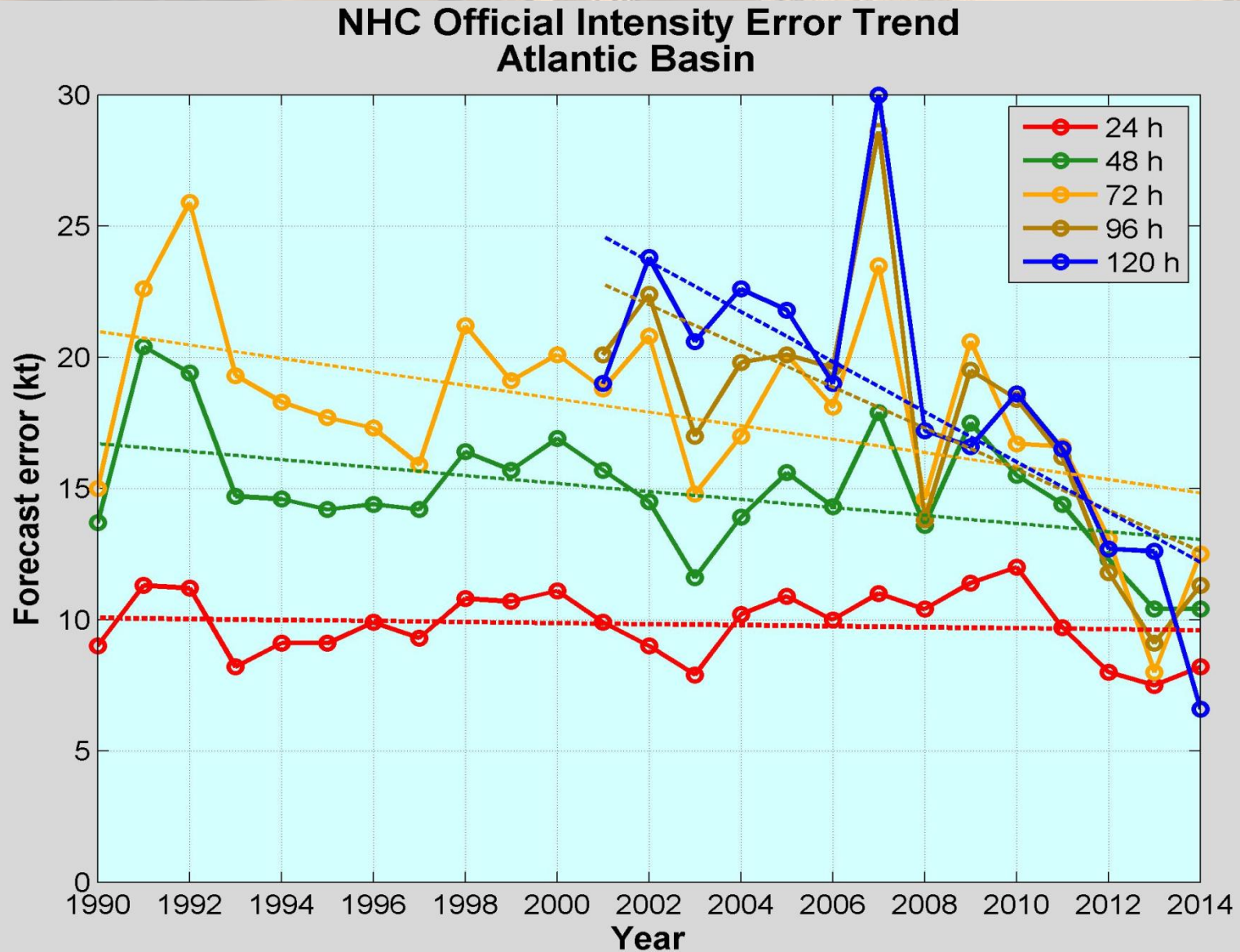


# First Things: Better Forecasts

NHC Official Average Track Errors  
Atlantic Basin Tropical Storms and Hurricanes

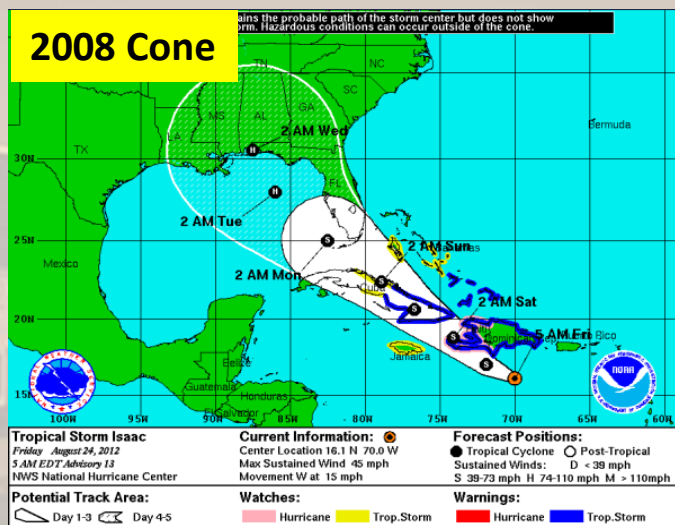


# First Things: Better Forecasts

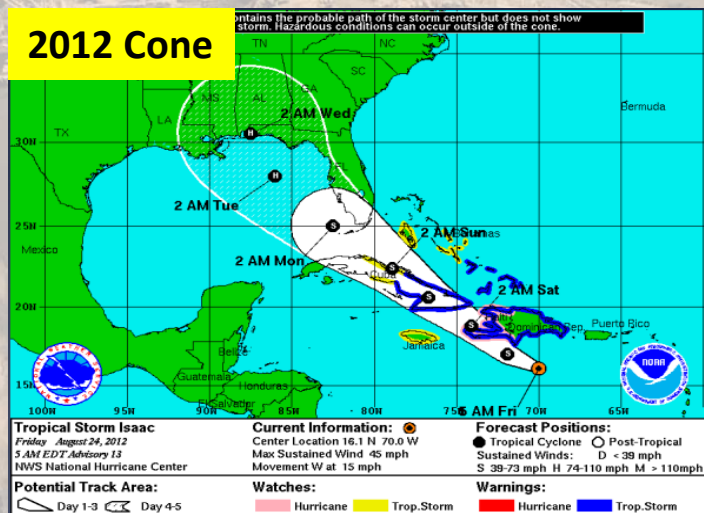


# First Things: Better Forecasts

## 2008 Cone

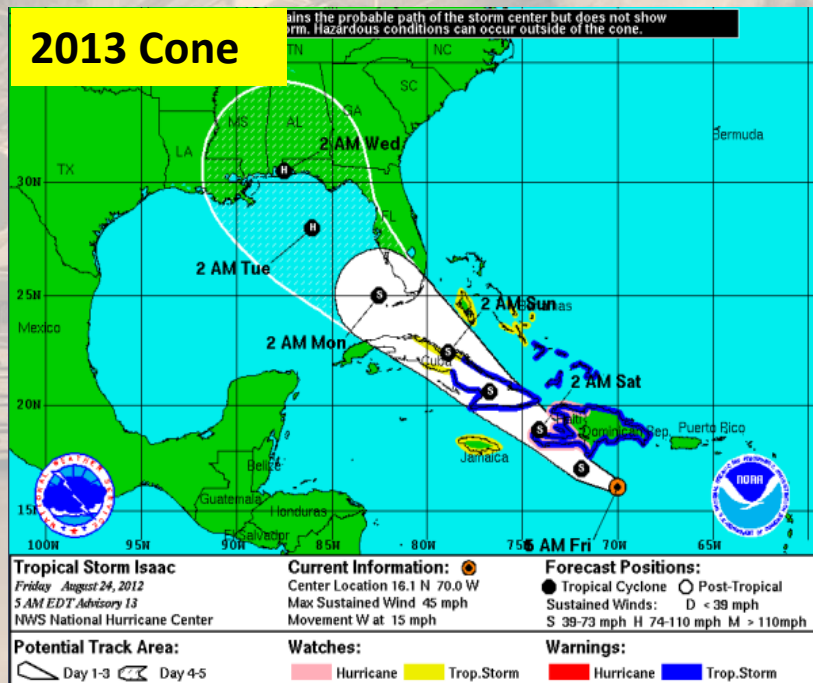


## 2012 Cone



## 2015 Cone

## 2013 Cone

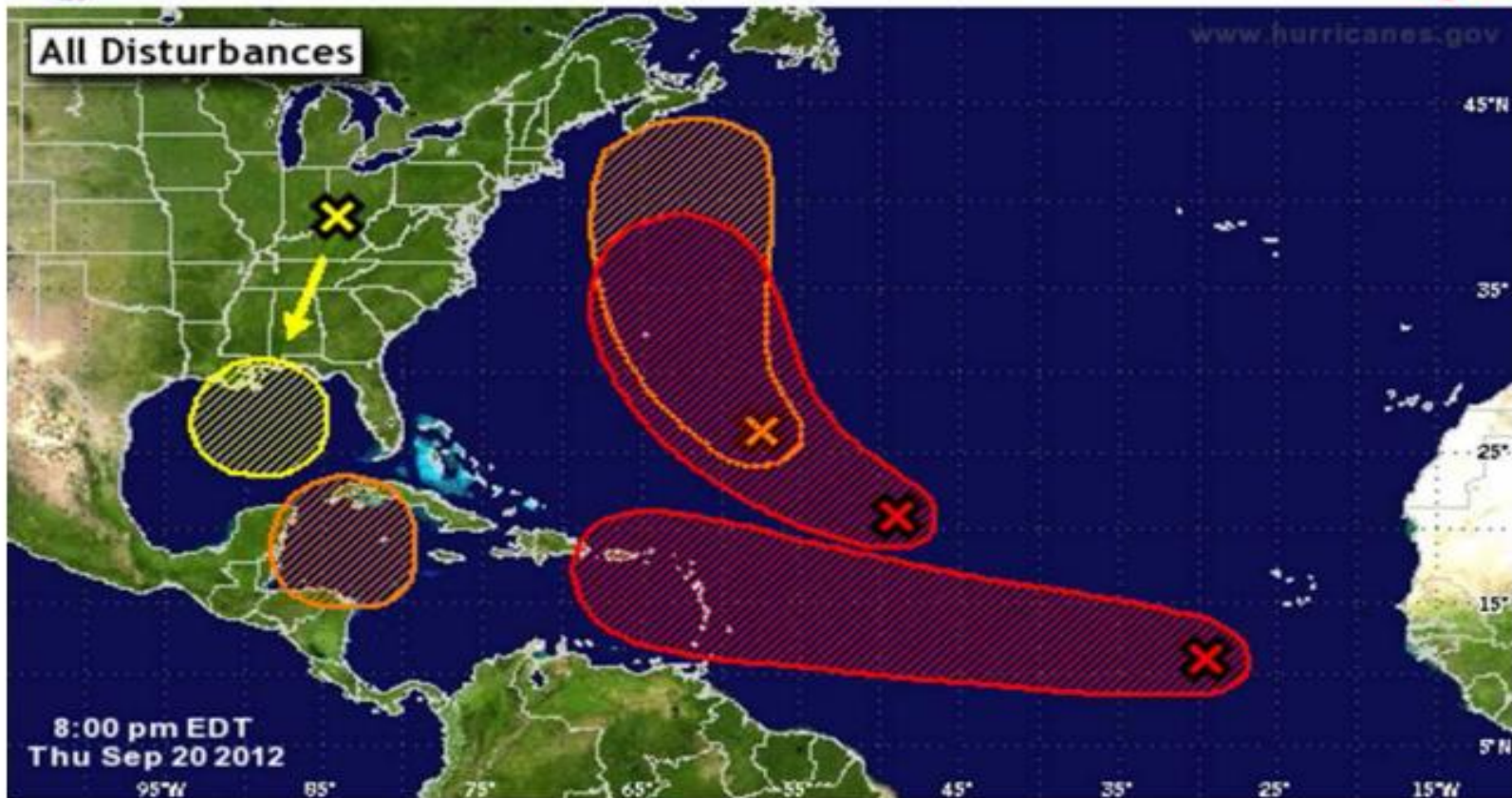


Forecast Period (hours)	Circle radius Atlantic Basin (nautical miles)	Circle radius Eastern North Pacific Basin (nautical miles)
12	32	26
24	52	42
36	71	54
48	90	69
72	122	100
96	170	143
120	225	182

# Better Forecasts = Refined Products (National Hurricane Center)



## Five-Day Graphical Tropical Weather Outlook National Hurricane Center Miami, Florida



Tropical Cyclone Formation Potential for the 5-Day Period Ending 8:00 pm EDT Tue Sep 25 2012

Chance of Cyclone Formation in 5 Days:   Low < 40%   Medium 40-60%   High > 60%

X indicates current disturbance location; shading indicates potential formation area.

# More to the Story...Than Category

**Storm Surge Flooding**



**Tornadoes**



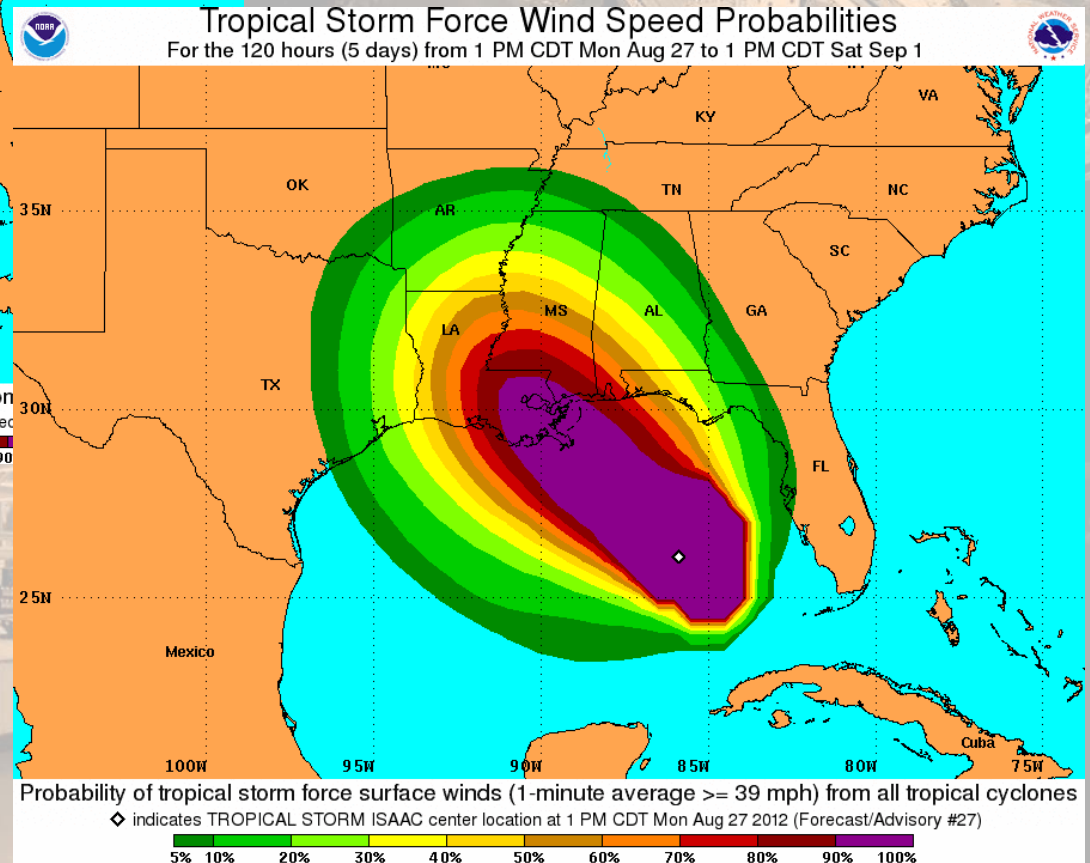
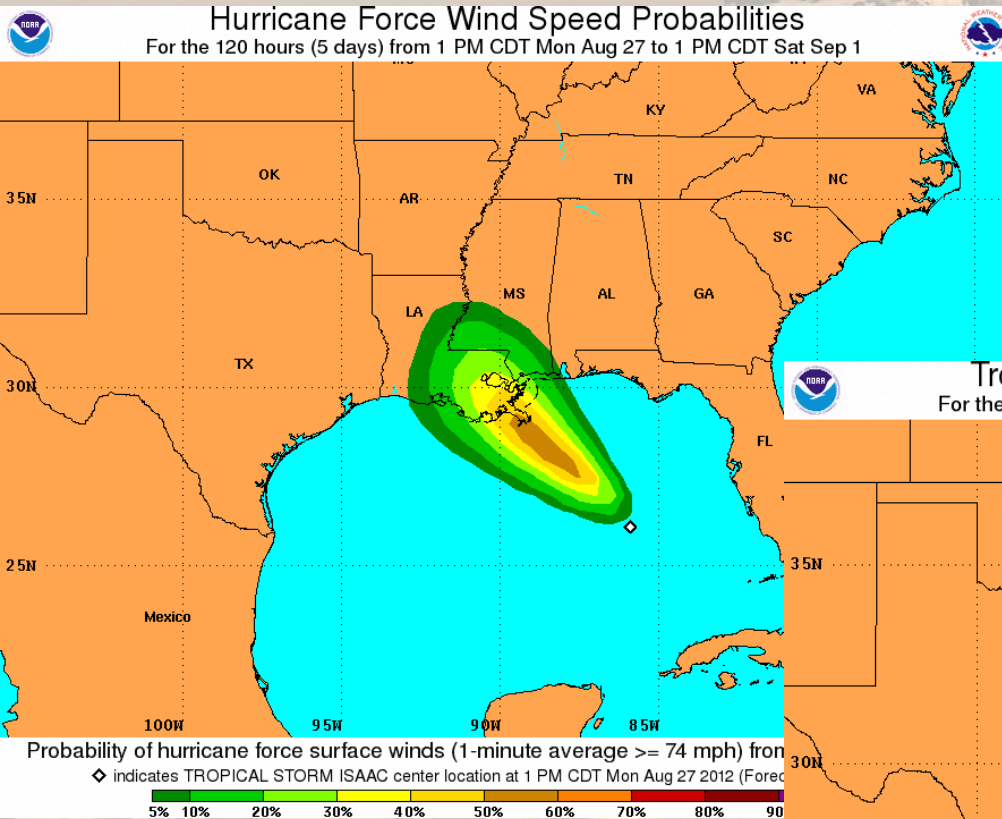
**Damaging Winds**



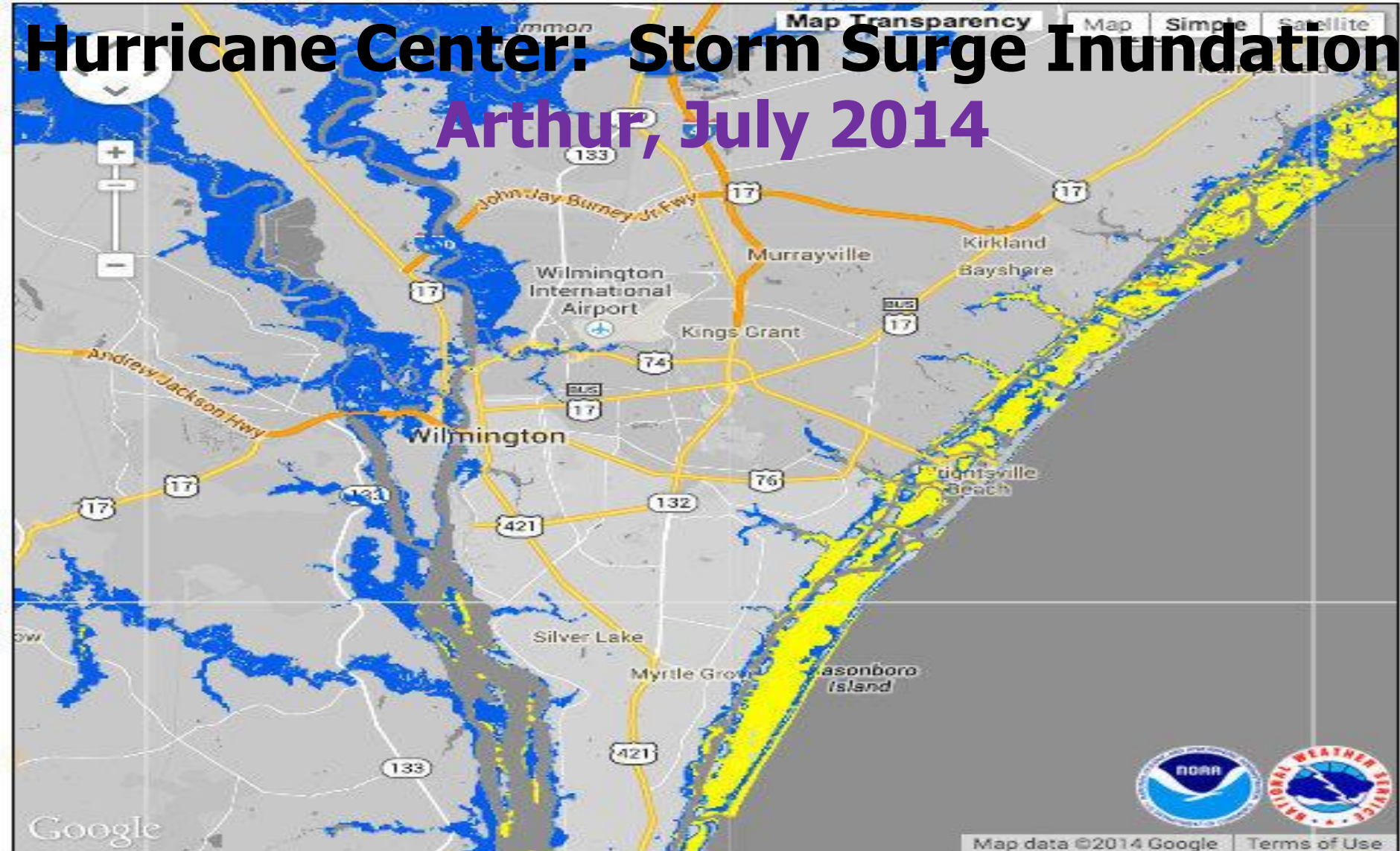
**Flooding Rains**



# Hurricane Center: Wind Probabilities



**Hurricane Center: Storm Surge Inundation**  
**Arthur, July 2014**



### Potential Storm Surge Flooding\*

- |  |                                  |
|--|----------------------------------|
|  | Up to 3 feet above ground        |
|  | Greater than 3 feet above ground |
|  | Greater than 6 feet above ground |
|  | Greater than 9 feet above ground |

\*Displayed flooding values indicate the water depth that has about a 1-in-10 (10%) chance of being exceeded.

Experimental Potential Storm Surge Inundation GIS datasets will not be disseminated during the 2014 Atlantic Hurricane Season.

Larger

# Hurricane Center: Experimental Storm Surge Warning Graphic, for 2015



Hurricane X Advisory #00



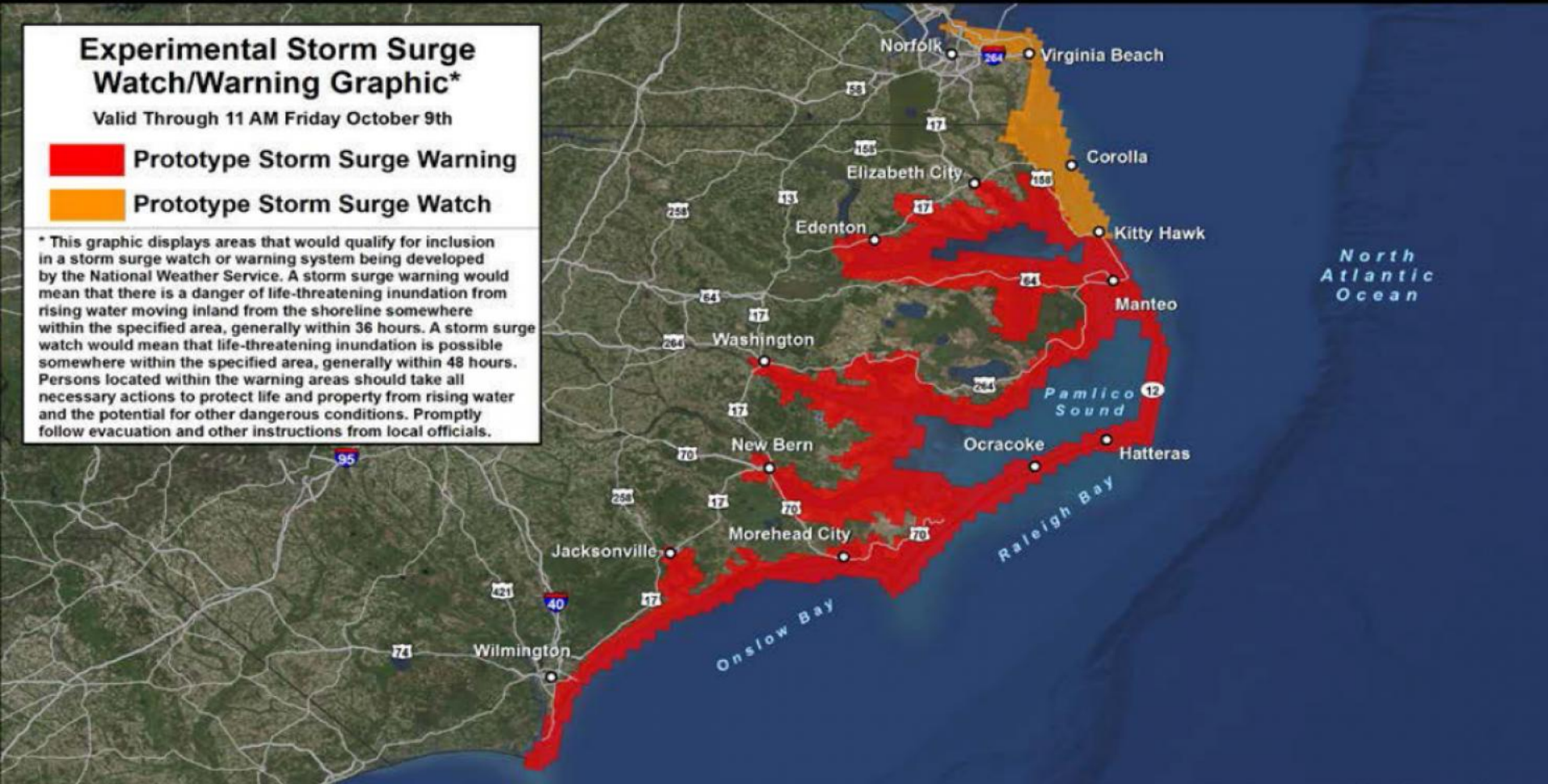
0 20 40 80 Miles

## Experimental Storm Surge Watch/Warning Graphic\*

Valid Through 11 AM Friday October 9th

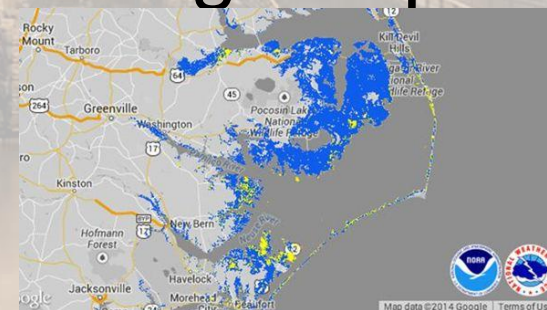
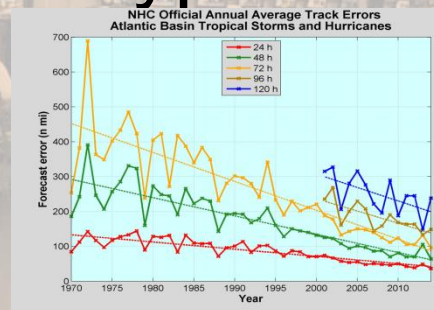
-  Prototype Storm Surge Warning
-  Prototype Storm Surge Watch

\* This graphic displays areas that would qualify for inclusion in a storm surge watch or warning system being developed by the National Weather Service. A storm surge warning would mean that there is a danger of life-threatening inundation from rising water moving inland from the shoreline somewhere within the specified area, generally within 36 hours. A storm surge watch would mean that life-threatening inundation is possible somewhere within the specified area, generally within 48 hours. Persons located within the warning areas should take all necessary actions to protect life and property from rising water and the potential for other dangerous conditions. Promptly follow evacuation and other instructions from local officials.



# The Confidence to Help You Make Better Decisions – National Level

- Nat'l Hurricane Center Track Improvements Increase Confidence on Location
- Improved Computing Power, Techniques Helped Refine Wind Probabilities
- Research/Techniques (Physical and Social Science) and Computing Power Provide Ability to Produce Surge Inundation Graphics and Prototype Storm Surge Warning Graphic



# What About for Your Local Decisions?

- Long Range (3-5 days out): Hurricane Decision Matrix(? – in testing)
- Mid Range to Event:
  - Hurricane Threats and Impacts (HTI)
- Event to Recovery:
  - Local Office Updates on Potential Hazards

# Hurricane Matrix (72 - 120hrs from landfall)

	Winds	Surge	Rainfall/ Flooding	Percentage of the Coast (Disregard for this Exercise)
<b>Low (1)</b>	Tropical Storm (39-73 mph) or Category 1 (74-95 mph) force winds	Minor coastal flooding	Minor flooding in low lying areas	25% of the TX Coastline
<b>Moderate (2)</b>	Category 2 force winds (96-110mph)	Moderate coastal flooding	Moderate flooding and flash flooding	50% of the TX Coastline
<b>High (3)</b>	Category 3 force winds (111-129mph)	Major coastal flooding	Widespread flooding and flash flooding; rivers overflow their banks	75% of the TX Coastline
<b>Extreme (4)</b>	Category 4 (130-156 mph) or 5 (> 157 mph) force winds	Widespread major coastal flooding	Record or near-record flooding; several rivers overflow their banks	100% of the TX Coastline

# Threat Ranges/Suggested Actions

**1 to 3**

**Low.** Set up Contingency for Physical and Human Resources

**4 to 6**

**Moderate.** Activate Contingency. Ready resources for possible deployment (This will not cost \$\$)

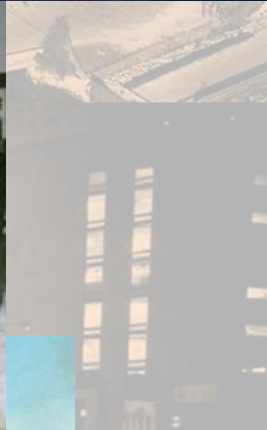
**7 to 9**

**High.** Move resources into position for expected deployment (This will cost \$\$)

**10 to 12**

**Extreme.** Begin deployment (example: AirEvac, Bus movement, PUP/Depot opening and staffing. (This will cost \$\$)

# Hurricane Threats and Impacts



*"When hurricane hazards dangerously intersect with communities and ecosystems..."*

# Hurricane Threats and Impacts



Hurricane Irene (2011)



"Hurricane" Sandy (2012)



Hurricane Isaac (2012)



*"...there are plenty of key decisions to be made and a considerable need for decision support."*

# A Story Beyond Category

- Beginnings
  - 1999: Suggestion for a “Flood Danger Scale” to Communicate Inland Flood Impact
  - 1999: Tampa Bay Media Requested “real world” wind impacts
  - Early 2000s: NWS Melbourne, FL, begins graphical hazardous weather outlooks



Former Chief Meteorologist Dick Fletcher  
(WTSP-TV-10)

The screenshot shows a web-based weather outlook interface. On the left is a vertical menu with categories like SKYWARN, THUNDERSTORM, HEAVY RAIN, SEASONAL, COASTAL / MARINE, RIVER, and TROPICAL. The main content area has a blue header with the title 'Graphical Hazardous Weather Outlook for east-central Florida' and the issue time '950 PM EDT WED MAR 27 2013'. Below the header is a 'Threat Level Scale' legend with five levels: Extreme (red), High (orange), Moderate (yellow), Low (light green), and Non-Threatening (white). To the left of the main text is a 'Tornado' selector with a hand icon pointing to 'HEAVY RAIN (Flash) Flood'. The main text area contains the following text:

950 PM EDT WED MAR 27 2013

THIS HAZARDOUS WEATHER OUTLOOK IS FOR EAST CENTRAL FLORIDA.

.DAY ONE...TONIGHT.

.EXCESSIVE COLD IMPACT...

UNSEASONABLY COLD TEMPERATURES ARE EXPECTED AGAIN TONIGHT WITH A BETTER CHANCE FOR FROST. TEMPERATURES ARE FORECAST TO FALL INTO THE MID 30S EARLY THURSDAY MORNING ACROSS PORTIONS OF VOLUSIA AND LAKE COUNTIES...AS WELL AS OKEECHOBEE COUNTY AND INTERIOR PORTIONS OF THE TREASURE COAST. THESE COLD TEMPERATURES WILL COMBINE WITH LIGHT WINDS AND CLEAR SKIES TO PRODUCE AT LEAST PATCHY FROST IN THESE NORMALLY COLDER LOCATIONS. THERE IS ALSO A GOOD CHANCE RECORD LOWS WILL BE TIED OR BROKEN ACROSS EAST CENTRAL FLORIDA.

# Descriptive Impacts Development

- Tropical Cyclone Wind Impact Word Templates Created
  - NWS Tampa Bay with NWS Melbourne (2000)
  - Incorporated into NWS Tropical Product Suite (2001/2002)
  - Became “World Famous” When Used Prior to Hurricane Katrina’s Landfall (2005)
- Storm Surge Impacts Added for 2006 Season

# DO NOT VENTURE OUTSIDE!

This powerfully worded bulletin was issued by the National Weather Service on Sunday, Aug. 28, 2005, as Katrina bore down on the Gulf Coast.

URGENT - WEATHER MESSAGE  
NATIONAL WEATHER SERVICE NEW ORLEANS LA  
1011 AM CDT SUN AUG 28 2005

... DEVASTATING DAMAGE EXPECTED...

HURRICANE KATRINA...A MOST POWERFUL HURRICANE WITH UNPRECEDENTED STRENGTH...RIVALING THE INTENSITY OF HURRICANE CAMILLE OF 1969.

MOST OF THE AREA WILL BE UNINHABITABLE FOR WEEKS...PERHAPS LONGER. AT LEAST ONE HALF OF WELL CONSTRUCTED HOMES WILL HAVE ROOF AND WALL FAILURE. ALL GABLED ROOFS WILL FAIL...LEAVING THOSE HOMES SEVERELY DAMAGED OR DESTROYED.

THE MAJORITY OF INDUSTRIAL BUILDINGS WILL BECOME NON FUNCTIONAL. PARTIAL TO COMPLETE WALL AND ROOF FAILURE IS EXPECTED. ALL WOOD FRAMED LOW RISING APARTMENT BUILDINGS WILL BE DESTROYED. CONCRETE BLOCK LOW RISE APARTMENTS WILL SUSTAIN MAJOR DAMAGE...INCLUDING SOME WALL AND ROOF FAILURE.

HIGH RISE OFFICE AND APARTMENT BUILDINGS WILL SWAY DANGEROUSLY...A FEW TO THE POINT OF TOTAL COLLAPSE. ALL WINDOWS WILL BLOW OUT.

AIRBORNE DEBRIS WILL BE WIDESPREAD...AND MAY INCLUDE HEAVY ITEMS SUCH AS HOUSEHOLD APPLIANCES AND EVEN LIGHT VEHICLES. SPORT UTILITY VEHICLES AND LIGHT TRUCKS WILL BE MOVED. THE BLOWN DEBRIS WILL CREATE ADDITIONAL DESTRUCTION. PERSONS...PETS...AND LIVESTOCK EXPOSED TO THE WINDS WILL FACE CERTAIN DEATH IF STRUCK.

POWER OUTAGES WILL LAST FOR WEEKS...AS MOST POWER POLES WILL BE DOWN AND TRANSFORMERS DESTROYED. WATER SHORTAGES WILL MAKE HUMAN SUFFERING INCREDIBLE BY MODERN STANDARDS.

THE VAST MAJORITY OF NATIVE TREES WILL BE SNAPPED OR UPROOTED. ONLY THE HEARTIEST WILL REMAIN STANDING...BUT BE TOTALLY DEFOLIATED. FEW CROPS WILL REMAIN. LIVESTOCK LEFT EXPOSED TO THE WINDS WILL BE KILLED.

AN INLAND HURRICANE WIND WARNING IS ISSUED WHEN SUSTAINED WINDS NEAR HURRICANE FORCE...OR FREQUENT GUSTS AT OR ABOVE HURRICANE FORCE...ARE CERTAIN WITHIN THE NEXT 12 TO 24 HOURS.

ONCE TROPICAL STORM AND HURRICANE FORCE WINDS ONSET...DO NOT VENTURE OUTSIDE!

- The “Statement heard ‘round the world (Aug. 28, 2005)
- Was cited by U.S. Congressional and Executive Post-Storm Assessments as Potentially Life-Saving
- Resides in Newseum Katrina Exhibit (photo taken in 2010)

# Impacts...and Science

- Operationally, Impact Information was Deterministic and Text-Only through 2005
- However, NWS Offices in Miami and Melbourne Experimenting with Impact Graphics since 2000<sup>1</sup>
- In 2005, NHC Began Experimental Tropical Cyclone Wind Speed Probabilities
- NWS Miami and Melbourne Began Testing Algorithms to Incorporate Forecast Uncertainty<sup>2</sup>

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<sup>1</sup> Sharp, D. W., et. al., 2000: **Graphically depicting east-central Florida hazardous weather forecasts**

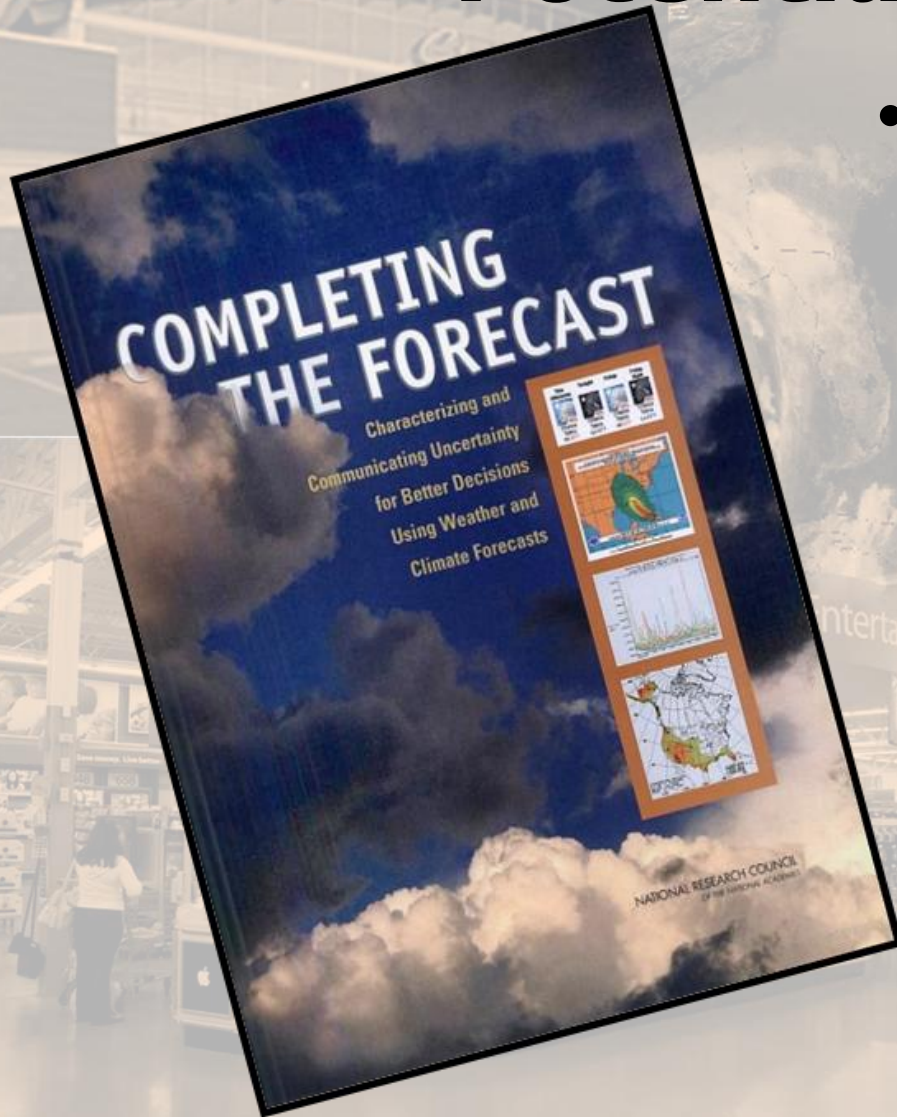
<sup>2</sup>Sharp, D.W., et.al., 2006: **Employing tropical cyclone wind probabilities to enhance local forecasts and improve guidance for decision-makers**

# Threat Graphics - 2005



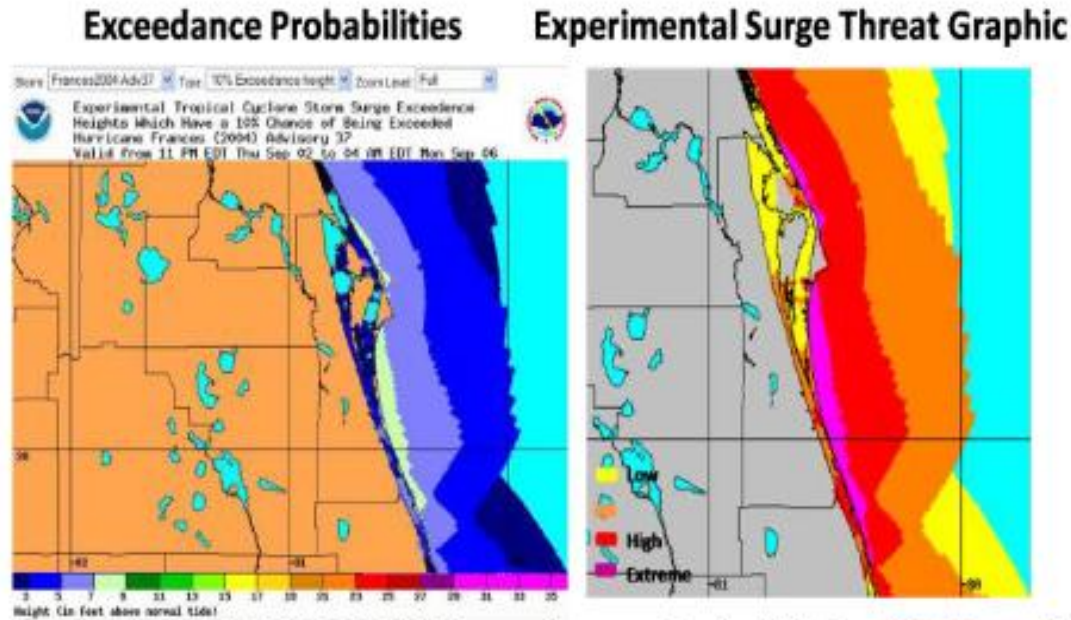
THREAT INDEX	RECOMMENDED ACTIONS
Extreme Wind Threat	Preparations should be made for the likelihood of major hurricane-force winds; the chance of Category 3, 4, or 5 hurricane-force winds (winds greater than 110 mph) typically resulting in extensive wind damage.
High Wind Threat	Preparations should be made for the likelihood of strong hurricane-force winds; the chance of Category 2 hurricane force winds (96 to 110 mph) typically resulting in major wind damage.
Moderate Wind Threat	Preparations should be made for the likelihood of hurricane-force winds; the chance of Category 1 hurricane force winds (74 to 95 mph) typically resulting in moderate wind damage.
Low Wind Threat	Preparations should be made for the likelihood of strong tropical storm-force winds; the chance of strong tropical storm force winds (58 to 73 mph) typically resulting in minor to locally moderate wind damage.
Very Low Wind Threat	Preparations should be made for the likelihood of tropical storm-force winds; the chance of tropical storm force winds (39 to 57 mph) typically resulting in minor wind damage.
Non-Threatening	Tropical storm-force winds are non-threatening; "windy" conditions may still be present.

# 2006-2008: Risk, Threat, and Potential Impact



- National Academies report issued, urging Weather Enterprise to transition from pure deterministic forecasts to probabilistic forecasts (2006)

# 2006-2008: Risk, Threat, and Potential Impact



**Figure 4.** NWS MDL Exceedance Probabilities (left), and experimental storm surge threat graphic from WFO Melbourne, FL (images courtesy of Dave Sharp).

- 2007: NHC Wind speed Probability Becomes Official
- 2008: NHC Storm Surge Probability Experimental
- 2008: Tornado Probabilities from Storm Prediction Center (already available since 2001)

# 2008: Risk, Threat, and Potential Impact

## High

**Threat** - A critical threat to life and property; the likelihood for sustained Category 1 Hurricane-force winds (74 to 95 mph) with frequent gusts to Category 2 (96 to 110 mph).

**Minimum Action** - Prepare for major wind damage.

**Potential Impact** - Life-threatening winds are possible. The majority of older mobile homes will be severely damaged or destroyed. Those that remain will be uninhabitable until repaired. Houses of poor to average construction will have major damage including partial wall collapse and roofs being lifted off. Many will be uninhabitable until repaired. Well constructed houses will incur minor to moderate damage of shingles, siding, and gutters, as well as blown out unprotected windows. Partial roof failure is expected in industrial parks, especially to those buildings with light weight steel and aluminum coverings. Older low-rising apartment roofs may also be torn off, as well as siding and shingle damage. Airborne debris will cause damage, injury, and possible death. Power outages will be widespread. Numerous lines will be pulled down, and a number of power poles will fall.

All trees with rotting bases will uproot or snap. Nearly all large healthy branches will snap. Healthy trees will uproot, especially where ground is saturated. Major damage is expected to citrus orchards. Most newly planted crops will be damaged.

**Threat** - A significant threat to life and property; the likelihood for sustained high end tropical storm force winds (58 to 73 mph) with gusts to Category 1 Hurricane Force winds (74 to 95 mph).

**Minimum Action** - Prepare for moderate wind damage.

**Potential Impact** - Most mobile homes will experience moderate to substantial damage. Some of poor construction will be destroyed. Houses of poor to average construction will have significant damage to shingles, siding, and gutters; more serious structural damage is possible. Unprotected windows may blow out. Many screened porches will be damaged. Well constructed homes will also see shingle and siding damage, especially with longer lasting winds. Unfastened light to moderate weight items will become airborne causing additional damage and possible injury. Hundreds of wires will be blown down. Local power outages will affect entire neighborhoods.

Many large branches of healthy trees will be snapped, and rotting small to medium sized trees will be uprooted. Numerous palm fronds will be blown down, and minor to moderate damage will occur to citrus orchards and newly planted lowland crops.

## Moderate

**Dolly, 2008**  
**(5 AM July 23 Assessment)**



# Hey, Remind Me Again...



- With tropical cyclones, it's all about impacts.
  - In “*decision-assistance*” terms, we're helping people to execute their disaster plan according to the **potential impacts** for which they should be making responsible preparation.

- Consider that for a threatened population during an event, if you advocate preparations everywhere be made:

**No** ➡ • For the worst of all possible impacts, you may exhaust valuable resources and “*cry wolf*” among those who end up being barely hit.

**No** ➡ • For the least of all possible impacts, you may jeopardize the lives and safety of those who end up being hardest hit.

**Yes** ➡ • For **the worst of all plausible impacts**, you allow people to become more proactive in the readiness process.

- In short, this speaks to protecting lives and property in realistic terms, not in overly-pessimistic or overly-optimistic terms.



# NWS Strategic Outcome: Weather-Ready Nation Strategic Goals

## Strategic Outcome: Weather-Ready Nation

- Ready ←
- Responsive ←
- Resilient ←



## NWS Strategic Goals

- Improve Weather Decisions Services
- Improve Water Forecasting Services
- Enhance climate services and adapt to climate-related risks
- Improve sector-relevant information in support of economic productivity
- Enable environmental forecast services supporting healthy communities and ecosystems
- Sustain a highly skilled, professional workforce equipped with training, tools, and infrastructure to meet mission

*Prediction is what makes us unique!*



# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

- This question is relative to community decisions being made by emergency managers.
- But it also includes personal decisions being made by public citizens... ***and business!***
- Actions are according to prescribed Emergency Plans:
  - Based on risk/vulnerability regarding each hurricane hazard
    - *High Wind*
    - *Storm Surge*
    - *Flooding Rain*
    - *Tornadoes*
  - Enacted in context of the event at hand; with key decisions supported by NWS





# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

- Examples of Poor Decision-Making:
  - Deciding not to take protective actions for any event
  - Deciding to take protective actions as if every event were historic and extreme
  - Deciding to take protective actions as if the current forecast is exactly perfect





# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

- Examples of Poor Decision-Making:
  - Deciding not to take protective actions for any event
  - Deciding to take protective actions as if every event were historic and extreme
  - Deciding to take protective actions as if the current forecast is exactly perfect

***Communities and Business must be supported by information which leads to good decisions and proportional actions.***





# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

- Examples of Poor Decision-Making:
  - Deciding not to take protective actions for any event
  - Deciding to take protective actions as if every event were historic and extreme
  - Deciding to take protective actions as if the current forecast is exactly perfect

***Individuals must also be supported by information which leads to good decisions and proportional actions.***





***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

- Decisions That Lead to Proportional Actions:



- **Dilemma:**

- *Extent to Protect Life/Property* vs. *Extent to Expend Time/Resources*

- **Solution:**

- *Prepare to the extent threatened*
    - *Implement Emergency Plan accordingly*



**DSS**



## ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

- The one thing that is most desired by decision-makers is the one thing **we cannot provide** ...

***... a perfect forecast !!!***

- There is always some measure of inherent forecast error.
- Which means that the latest forecast is actually a singular plausible outcome that simply represents our current best effort.





***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

- If a margin of safety is needed, then other plausible outcomes must be weighed to account for uncertainty.

*“You’re going talk about probability data now, aren’t you?”*





# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

- **Typical Projection Scenarios:**

- ***“Most Likely Scenario”*** - deterministic

- our best forecast
    - the official forecast

- ***“Reasonable, Worst Case Scenario”*** - probabilistic

- the plausible, least regret forecast
    - the safety margin forecast

**Both are needed, but a reasonable-worst case assessment can tell you the extent to which preparations should be undertaken.**



**DSS**



***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***



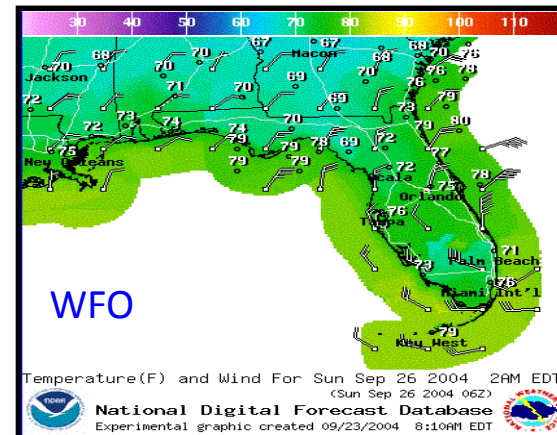
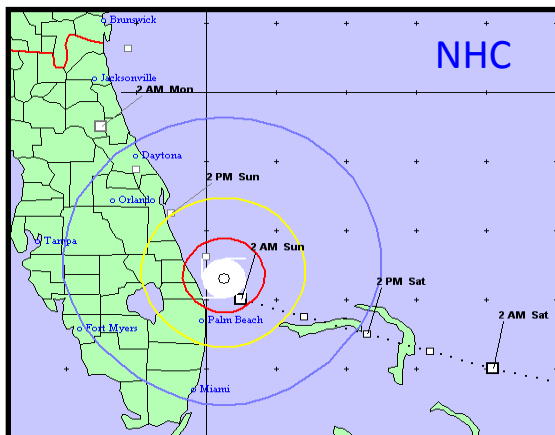
- ***“Reasonable, Worst Case Scenario”*** - probabilistic
  - the plausible, least regret forecast
  - the safety margin forecast

**DSS**



# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

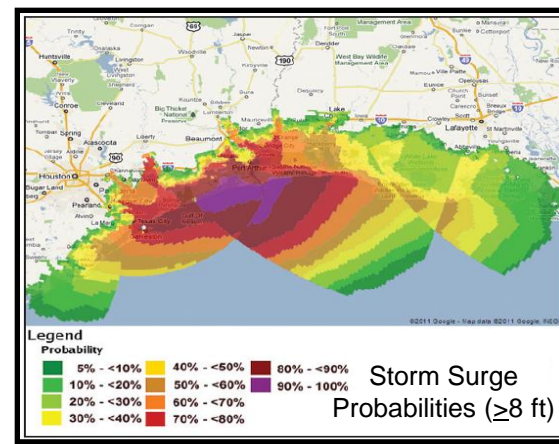
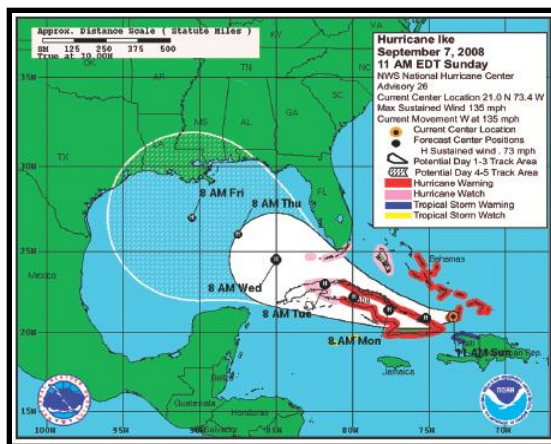
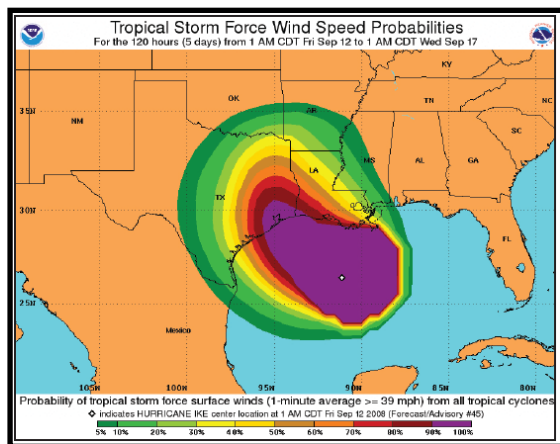
- We are comfortable with conveying our latest forecast.
- But we still struggle with conveying uncertainty when attempting to factor in an appropriate safety margin.
  - Rules of Thumb (subjective; empirical)
  - Error Cone (track errors only)





# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

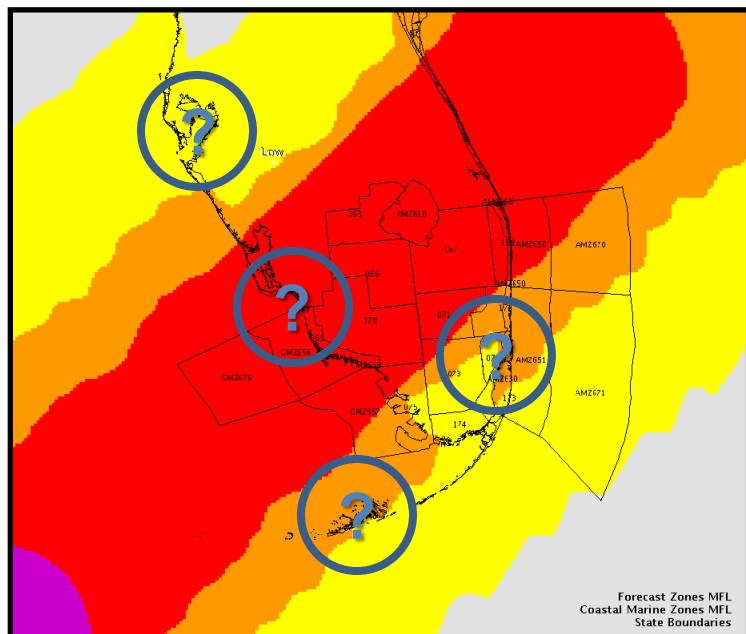
- We are comfortable with conveying our latest forecast
- But we still struggle with conveying uncertainty when attempting to factor in an appropriate margin of safety
  - Rules of Thumb (subjective; empirical)
  - Error Cone (track errors only)
  - Raw Probabilities (for critical thresholds of wind, surge, etc.)





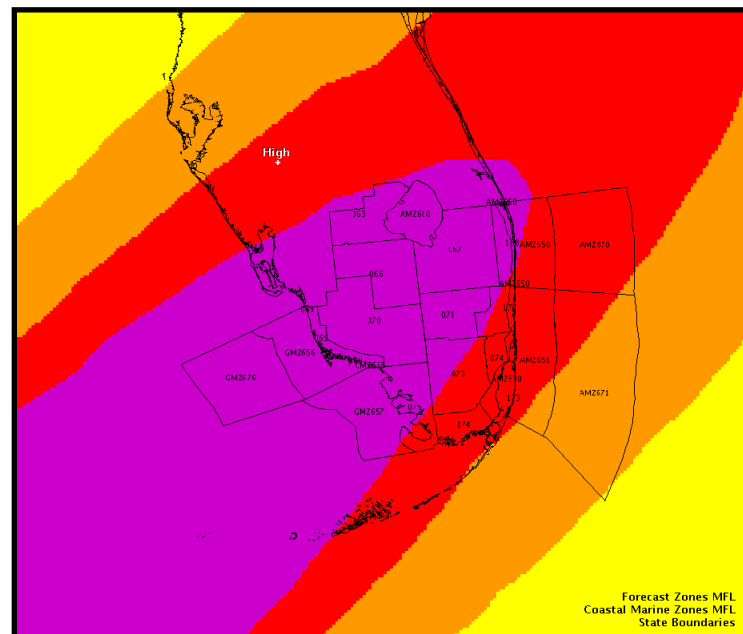
# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

Forecast: “Peak Wind Swath”



**Deterministic-only; zero error**

Forecast: “Peak Wind Threat”



**Probability included; ~10% exceedance**

**Example:** A major hurricane approaching southwest Florida at the onset of the warning period (~ 36 hours)

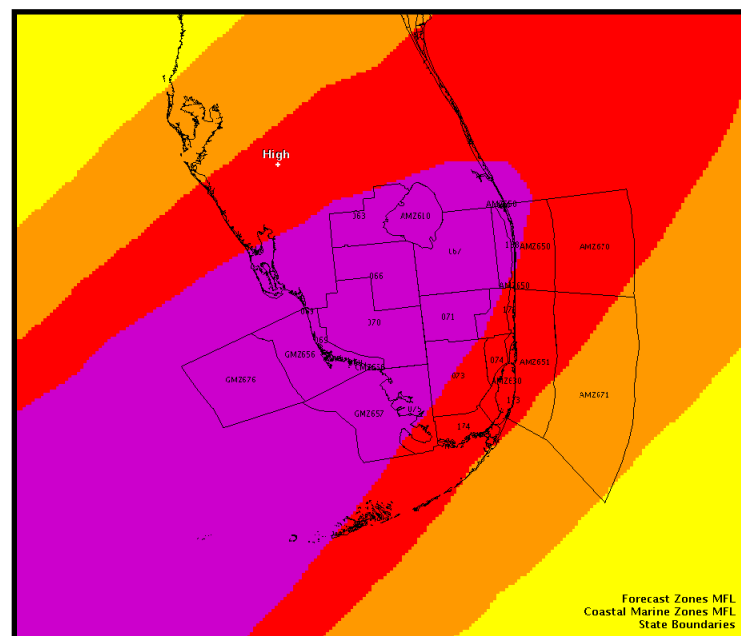
Wind Hazard
Major Hurricane Force ( $\geq 96$ kt)
Hurricane Force (64 - 95 kt)
Strong Tropical Storm Force (50 - 63 kt)
Tropical Storm Force (34 - 49 kt)
Less Than Tropical Storm Force (< 34 kt)



# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

The implicit delivery of probability information using color-coded **threat levels** based on common thresholds depicted within graphics (and grids)

Forecast: “**Peak Wind Threat**”



Probability included; ~10% exceedance

**Example:** A major hurricane approaching southwest Florida at the onset of the warning period (~36 hours)

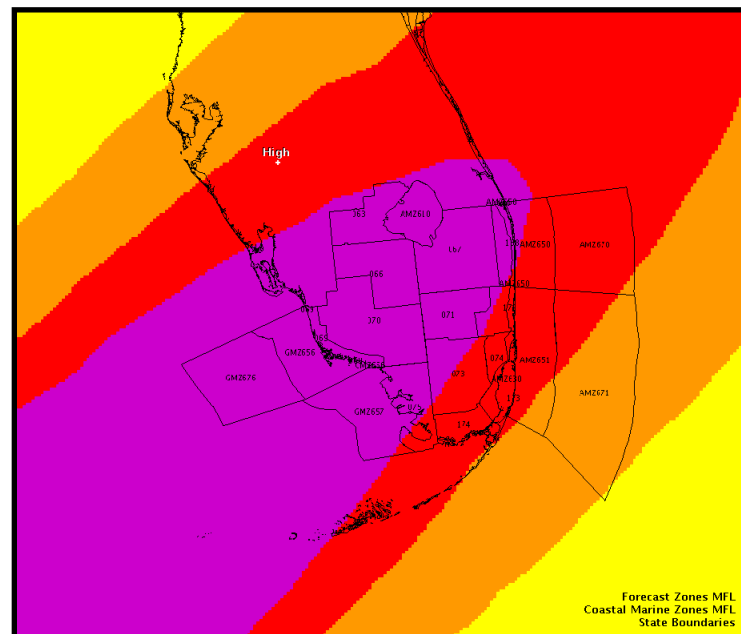
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Major Hurricane Force ( $\geq 96$ kt)
Hurricane Force (64 - 95 kt)
Strong Tropical Storm Force (50 - 63 kt)
Tropical Storm Force (34 - 49 kt)
Less Than Tropical Storm Force (< 34 kt)



# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

THREAT
EXTREME
HIGH
MODERATE
ELEVATED
LITTLE TO NONE

Forecast: ***"Peak Wind Threat"***



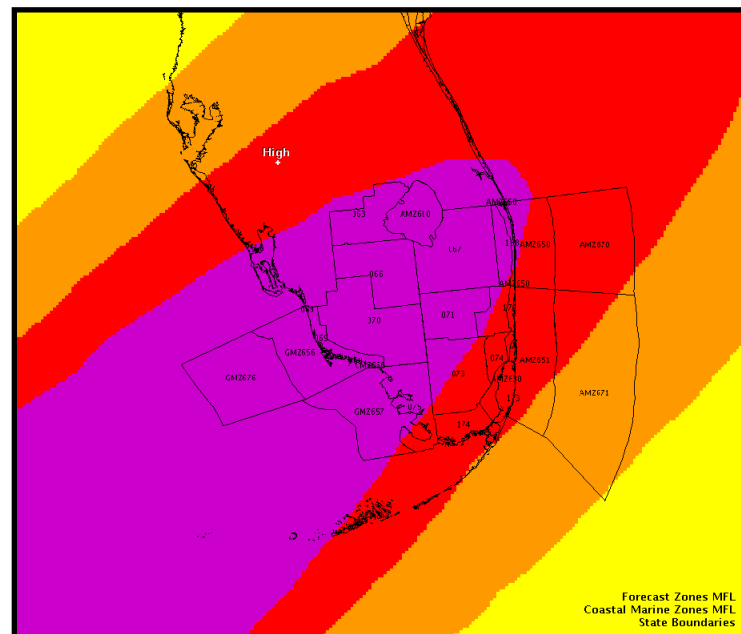
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Strong Tropical Storm Force (50 - 63 kt)
Tropical Storm Force (34 - 49 kt)
Less Than Tropical Storm Force (< 34 kt)



# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

THREAT	POTENTIAL IMPACTS
EXTREME	DEVASTATING TO CATASTROPHIC
HIGH	EXTENSIVE
MODERATE	SIGNIFICANT
ELEVATED	LIMITED
LITTLE TO NONE	LITTLE TO NONE

Forecast: ***"Peak Wind Threat"***



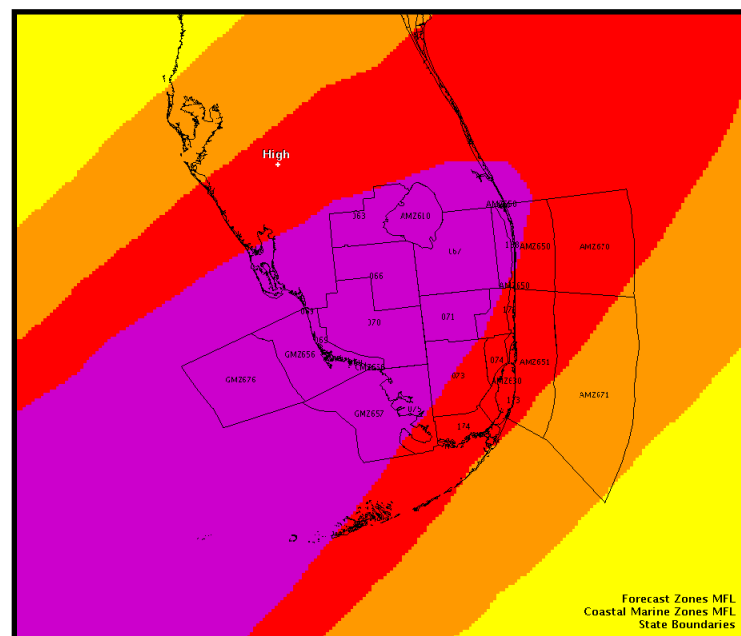
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Major Hurricane Force ( $\geq 96$ kt)
Hurricane Force (64 - 95 kt)
Strong Tropical Storm Force (50 - 63 kt)
Tropical Storm Force (34 - 49 kt)
Less Than Tropical Storm Force (< 34 kt)



# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

Wind Threat	Potential Wind Impacts
<b>EXTREME</b>  Threat for wind greater than 110 mph	<b>DEVASTATING TO CATASTROPHIC</b>  To be safe, aggressively prepare for the potential of devastating to catastrophic wind impacts from major hurricane force wind of equivalent Category 3 intensity or higher.
<b>HIGH</b>  Threat for wind 74-110 mph	<b>EXTENSIVE</b>  To be safe, aggressively prepare for the potential of extensive wind impacts from hurricane force wind of equivalent Category 1 or 2 intensity.
<b>MODERATE</b>  Threat for wind 58-73 mph	<b>SIGNIFICANT</b>  To be safe, earnestly prepare for the potential of significant wind impacts from strong tropical storm force wind.
<b>ELEVATED</b>  Threat for wind 39-57 mph	<b>LIMITED</b>  To be safe, prepare for the potential of limited wind impacts from tropical storm force wind.
<b>LITTLE TO NONE</b>  Wind less than 39 mph	<b>LITTLE TO NONE</b>  No immediate preparations needed; little to no wind impacts.

***Forecast: “Peak Wind Threat”***

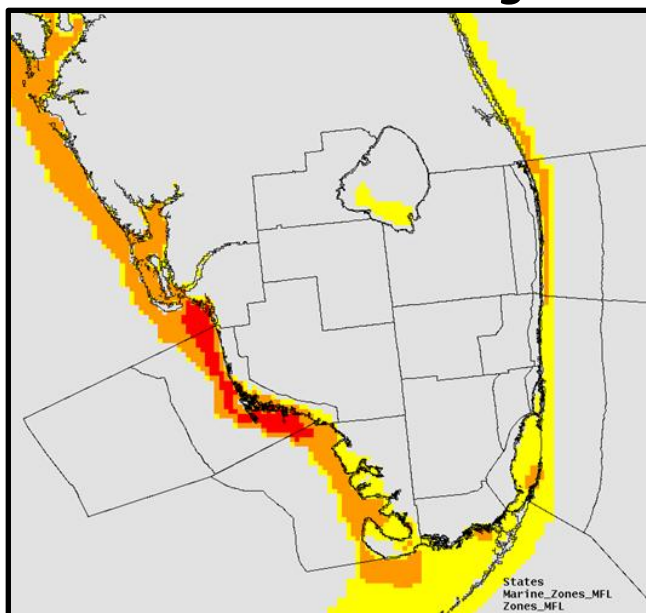


**Actionable Information**: by translating/interpreting threat information into potential impacts information



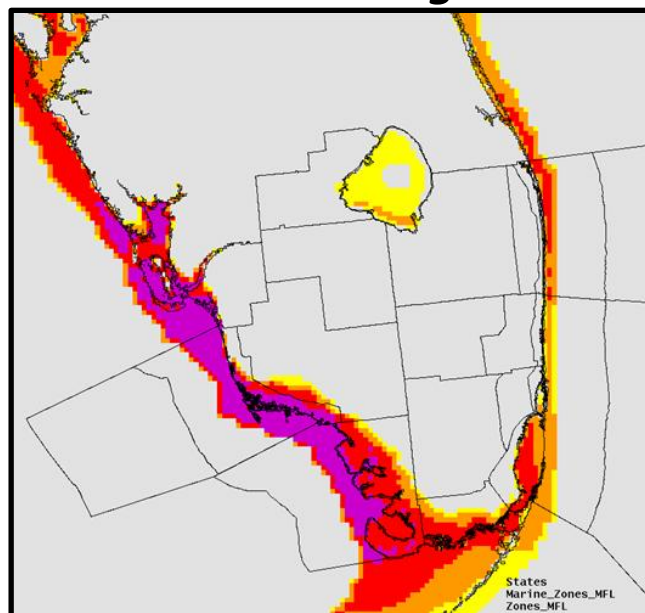
# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

Forecast: “Peak Surge”



Deterministic SLOSH; zero error

Forecast: “Peak Surge Threat”



Probability included; 10% exceedance

**Example:** A major hurricane approaching southwest Florida at the onset of the warning period (~ 36 hours)

Storm Surge & Tide Hazard

Surge Inundation > 9 ft agl

Surge Inundation 6 - 9 ft agl

Surge Inundation 3 - 6 ft agl

Surge Inundation 1 - 3 ft agl

Surge Inundation < 1 ft agl

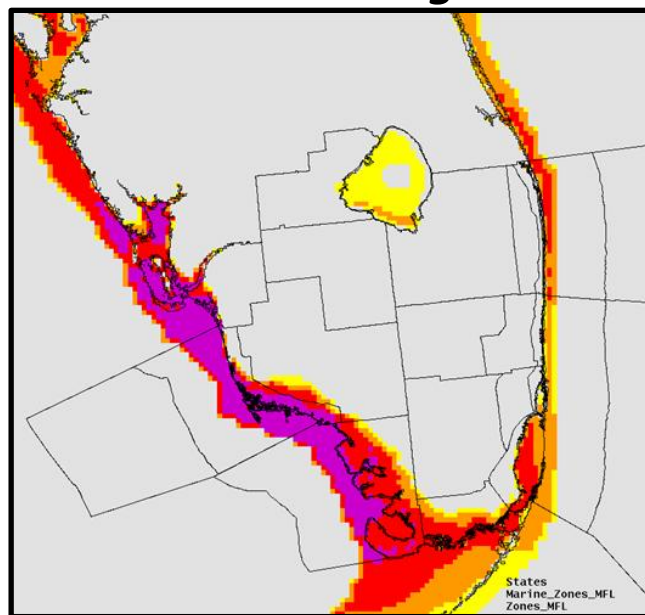


# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

*Again...*

The implicit delivery of probability information using color-coded **threat levels** based on common thresholds depicted within graphics (and grids)

*Forecast: “Peak Surge Threat”*



**Probability included; 10% exceedance**

**Example:** A major hurricane approaching southwest Florida at the onset of the warning period (~ 36 hours)

## **Storm Surge & Tide Hazard**

Surge Inundation > 9 ft agl

Surge Inundation 6 - 9 ft agl

Surge Inundation 3 - 6 ft agl

Surge Inundation 1 - 3 ft agl

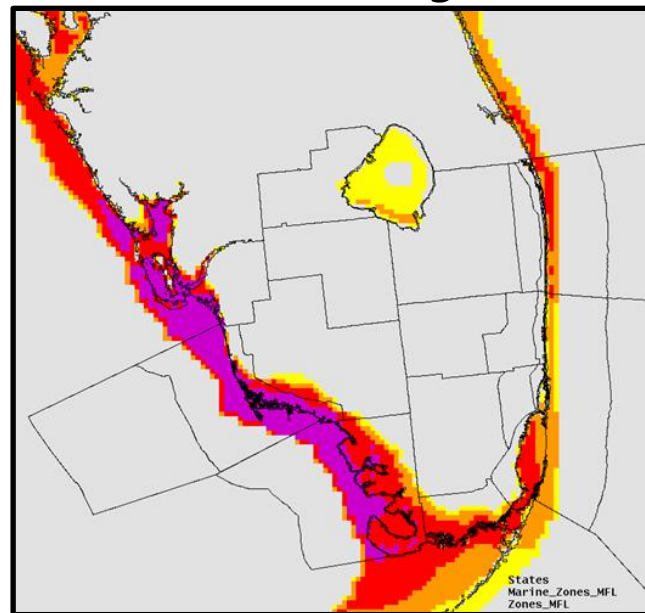
Surge Inundation < 1 ft agl



# ***When a hurricane threatens a coastal community, to what extent should preparations be undertaken?***

Storm Surge Threat	Potential Storm Surge Impacts
<b>EXTREME</b>  Threat for inundation greater than 9 feet above ground	<b>DEVASTATING TO CATASTROPHIC</b>  To be safe, aggressively prepare for the potential of devastating to catastrophic storm surge flooding impacts.
<b>HIGH</b>  Threat for inundation 6-9 feet above ground	<b>EXTENSIVE</b>  To be safe, aggressively prepare for the potential of extensive storm surge flooding impacts.
<b>MODERATE</b>  Threat for inundation 3-6 feet above ground	<b>SIGNIFICANT</b>  To be safe, earnestly prepare for the potential of significant storm surge flooding impacts.
<b>ELEVATED</b>  Threat for inundation 1-3 feet above ground	<b>LIMITED</b>  To be safe, prepare for the potential of limited storm surge flooding impacts.
<b>LITTLE TO NONE</b>  Little to no inundation	<b>LITTLE TO NONE</b>  No immediate preparations needed. Little to no potential storm surge flooding impacts.

*Forecast: “Peak Surge Threat”*



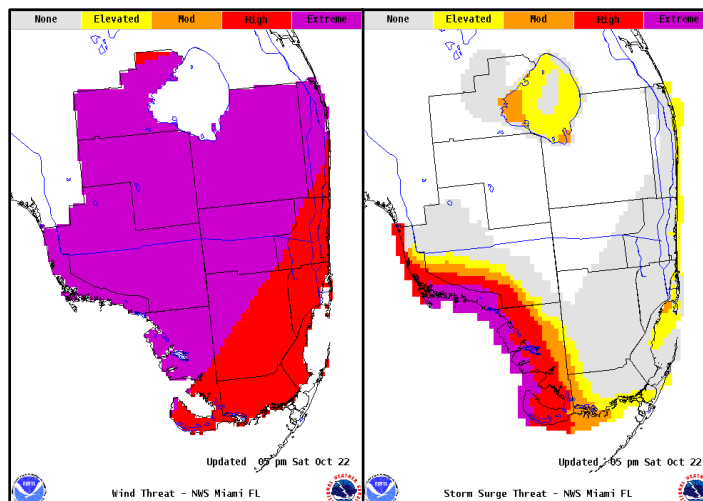
**Actionable Information**: by translating/interpreting threat information into potential impacts information



# Threat Assessments

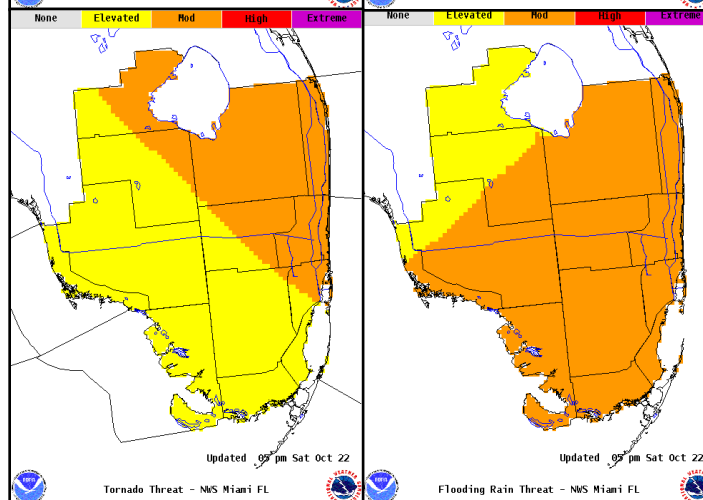
## Wind

<b>EXTREME THREAT</b> for wind greater than 110 mph
<b>HIGH THREAT</b> for wind 74-110 mph
<b>MODERATE THREAT</b> for wind 58-73 mph
<b>ELEVATED THREAT</b> for wind 39-57 mph
<b>LITTLE TO NO THREAT</b> wind less than 39 mph



## Storm Surge

<b>EXTREME THREAT</b> for surge flooding greater than 9 feet above ground
<b>HIGH THREAT</b> for surge flooding 6-9 feet above ground
<b>MODERATE THREAT</b> for surge flooding 3-6 feet above ground
<b>ELEVATED THREAT</b> for surge flooding 1-3 feet above ground
<b>LITTLE TO NO THREAT</b> little to no surge flooding



<b>EXTREME THREAT</b> for an outbreak of tornadoes
<b>HIGH THREAT</b> for numerous tornadoes
<b>MODERATE THREAT</b> for scattered tornadoes
<b>ELEVATED THREAT</b> for isolated tornadoes
<b>LITTLE TO NO THREAT</b> tornadoes not anticipated

## Tornadoes



## Flooding Rain

<b>EXTREME THREAT</b> for extreme rainfall flooding
<b>HIGH THREAT</b> for major rainfall flooding
<b>MODERATE THREAT</b> for moderate rainfall flooding
<b>ELEVATED THREAT</b> for minor rainfall flooding
<b>LITTLE TO NO THREAT</b> little to no rainfall flooding

**Prepare for These Potential Wind Impacts**  
*(for a practical, least regret approach when implementing your emergency action plan)*

<b>Devastating Impacts</b>	Preparations should be aggressively made for the potential of <i>devastating to catastrophic</i> impacts. If realized, extremely dangerous life-threatening winds may cause well-built framed structures to incur major to severe damage, including partial to complete roof and exterior wall failures. Numerous trees snapped or uprooted. Near total loss of power across extensive areas, with outages lasting from many days to weeks or months. <i>In worst cases, places could be uninhabitable for extended periods with immense human suffering.</i> Generalized descriptions are consistent with damage caused by major hurricane force winds of Category 3, 4, or 5 intensity (111 mph or greater).
<b>Substantial Impacts</b>	Preparations should be aggressively made for the potential of substantial impacts. If realized, dangerous life-threatening winds may cause well-built framed structures to incur major damage, including instances of partial roof and exterior wall failures. Considerable damage to roofing and siding materials. Many trees snapped or uprooted, especially shallow rooted trees. Numerous large branches also broken off. Scattered areas of power outages lasting several days to weeks. Generalized descriptions are consistent with damage caused by hurricane force winds (74 to 110 mph).
<b>Significant Impacts</b>	Preparations should be made for the potential of significant impacts. If realized, winds may cause well-built framed structures to incur moderate to considerable damage to roofing and siding materials. Some additional damage to porches, awnings, and carports. A few to several trees blown down, especially shallow rooted trees. Several large branches also broken off. Scattered areas of power outages lasting a few to several days. Generalized descriptions are consistent with damage caused by strong tropical storm force winds (58 to 73 mph) which are approaching Category 1 intensity.
<b>Limited Impacts</b>	Preparations should be made for the potential of limited impacts. If realized, high winds may cause well-built framed structures to incur minor to locally moderate damage to roofing and siding materials. Some additional damage to porches, awnings, and carports. A few to several trees blown down, especially shallow rooted trees. Several large branches also broken off. Isolated to widely scattered areas of power outages lasting a few to several days. Generalized descriptions are consistent with damage caused by tropical storm force winds (39 to 57 mph).
<b>No Impacts</b>	Preparations are not needed as impacts are unlikely. Winds to remain below tropical storm force (less than 39 mph), but breezy to windy conditions may still occur.

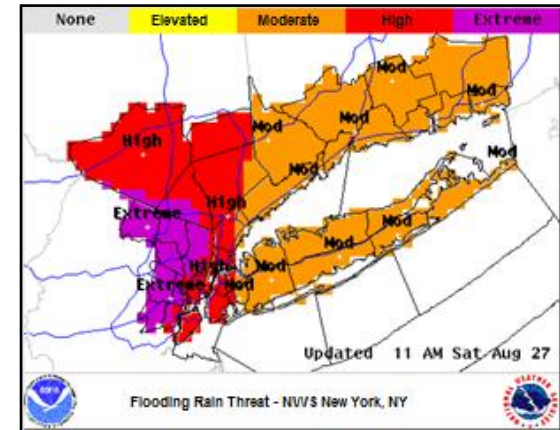
**These Will be Tailored  
to Your Local Area!**

# Hurricane Threats & Impacts (HTI)

- The HTI is specifically designed to answer our question:
  - *“When a hurricane threatens a coastal area, to what extent should preparations be made?”*
- The HTI product/solve some confusion when incorporating information for

**Represents the premise of HTI**

- probability information implicitly
  - rather than explicitly
  - Uses color-coded levels of threat (per hazard)
    - Warm to hot colors
    - Gridded/Graphical information
  - Provides corresponding Potential Impacts Statements

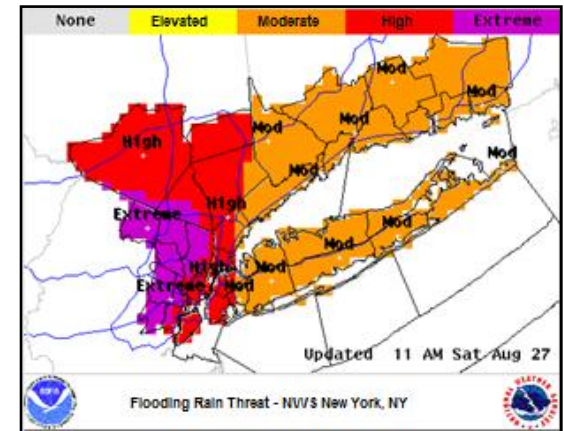


## Weather-Ready Nation

National Oceanic and Atmospheric Administration

# Hurricane Threats & Impacts (HTI)

- Provides corresponding potential impacts statements
  - Per level; actionable information; textual
  - Translated/interpreted into every day language
- Designed with guidance from social scientists
  - Experience; Focus Groups; Surveys; Reports
  - Colors, Labels, Threats vs. Impacts, Bar Charts, etc.



**Weather-Ready Nation**  
National Oceanic and Atmospheric Administration



# The Decision-Support Process

*For WFO Hurricane Operations*

## DSS - A Three Step Process

1. Assess the Threat
2. Develop a Plan for Translation/Interpretation of Forecasted Hazards  
and Issued Forecasts & Coordinated Safety Messages

**HTI designed to fit the DSS process**



# Tropical Cyclone Impact Graphics (2012 - 2014)

- On Web Interface for Part of 2015 Season
  - Uniformity Across the Gulf and Atlantic Coast for Storm Surge Potential Impact Inundation Levels
    - “Five feet above ground is the same, whether Texas or South Carolina”
  - General Uniformity for Wind...
    - ...But Impacts are Typically Higher from North Carolina to New England with Similar Wind Speeds (trees, root systems, hilly terrain, mixed resiliency infrastructure)
  - GIS (KML) based web pages allows for mosaics
  - <http://weather.gov/tcig>\*

\*This will change for 2016 season

\*New prototype “one stop shop” page that includes Hurricane Threats and Impacts should be available at some point during 2015 season



## Prepare For These Potential Impacts

(for a practical, least regret approach when implementing your emergency action plan)

### Extreme

\* 2011 Def

**Potential for Extreme Impact:** An extreme threat to life and property. Expect storm surge inundation 9 feet or more.

Prepare for the likelihood of extreme storm surge damage. Residents should take immediate action to protect life and heed evacuation advice from emergency management. People in the storm surge zone who have not evacuated should seek shelter in the nearest well built multi story building if possible. If evacuating to the attic take along a life jacket and ax to chop through the roof in the event severe flooding occurs.

### For 9 to 15 foot inundation.

**Southeast Louisiana** - Life threatening flooding possible in areas outside hurricane protection levees and in areas around Lakes Pontchartrain and Maurepas. Sections of west Jefferson, east St Charles and lower Lafourche hurricane protection levees could be over topped. Areas outside of hurricane protection levees will be severely inundated. People not heeding evacuation orders in single family, one or two story homes could face certain death. Many residences of average construction directly on the coast will be destroyed. Widespread and devastating personal property damage is likely elsewhere. Vehicles left behind will likely be swept away. Numerous roads will be swamped. Some may be washed away by the water. Entire flood prone coastal communities will be cutoff, perhaps for more than a week. Water levels may exceed 9 feet or more behind over topped levees. Significant storm surge flooding will move well inland especially along bays and bayous. Coastal residents in multi story facilities risk being cutoff for a week or more.

**Coastal Mississippi** - Life threatening flooding possible in coastal areas and along bays and coastal bayous. People not heeding evacuation orders in single family one or two story homes in the storm surge zone could face certain death. Many residences of average construction directly on the coast will be destroyed. Widespread and devastating personal property damage is likely elsewhere. Vehicles left behind will likely be swept away. Numerous roads will be swamped. Some may be washed away by the water. Entire flood prone coastal communities will be cutoff for several days. Significant storm surge flooding will move well inland especially along bays and bayous. Coastal residents in multi story facilities risk being cutoff for several days.

### For 15 to 20 feet or greater inundation.

**Southeast Louisiana** - Life threatening flooding is likely with deep and widespread storm surge flooding across many areas. Hurricane protection levees in southeast Louisiana will be over topped with potential of massive and widespread flooding. Severe flooding will occur around Lakes Pontchartrain and Maurepas impacting many communities near the lakes with deep flooding. Thousands of homes and vehicles will be flooded. Larger structures such as condominiums and hotels may be destroyed. Those with poor support may collapse. People who fail to evacuate may be swept to their deaths while others may be stranded for days surrounded by flood waters. Dozens of roads will be washed away. Water levels may exceed 15 feet or more behind over topped levees for several weeks. Full recovery will take months if not years.

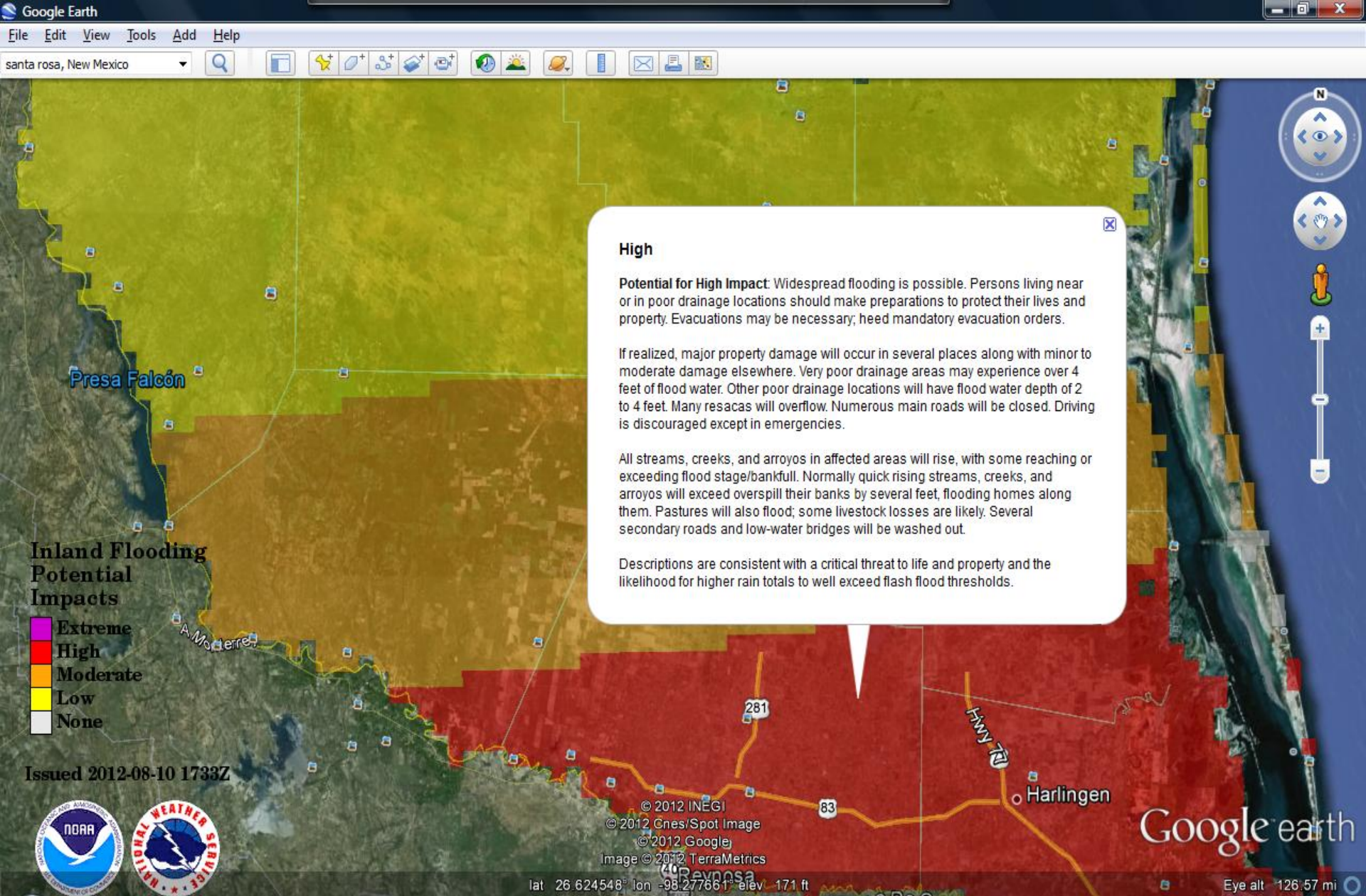
**Coastal Mississippi** - Life threatening flooding is likely with deep and widespread storm surge flooding across many areas. Storm surge and waves will pound the Mississippi coast with storm surge moving well inland, especially along bays, bayous and rivers. Thousands of homes and vehicles will be flooded. Larger structures

## Coastal Flooding Potential Impacts



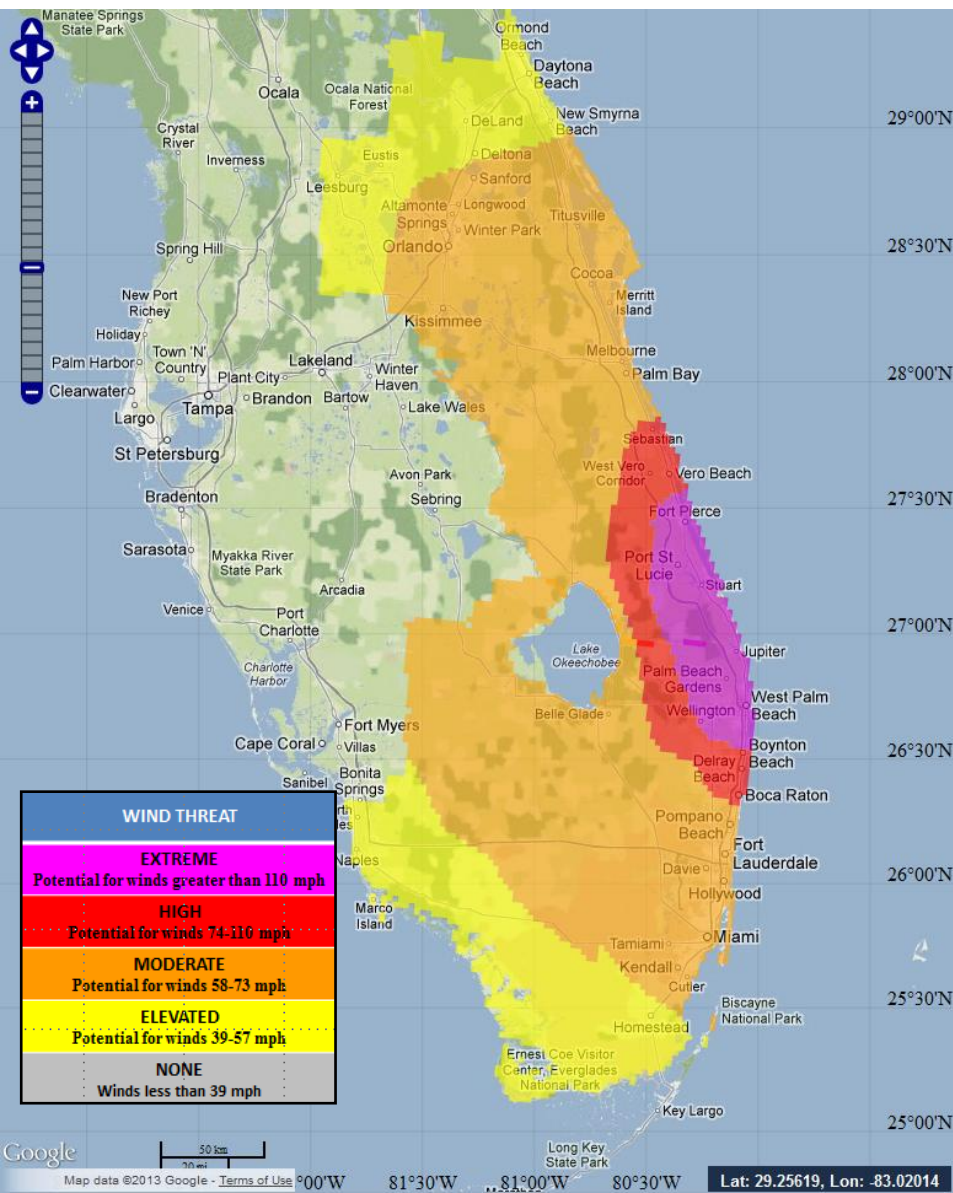
Issued 2012-08-27 1026Z





Mock-up of Inland Flood Potential Impact,  
Rio Grande Valley, Texas

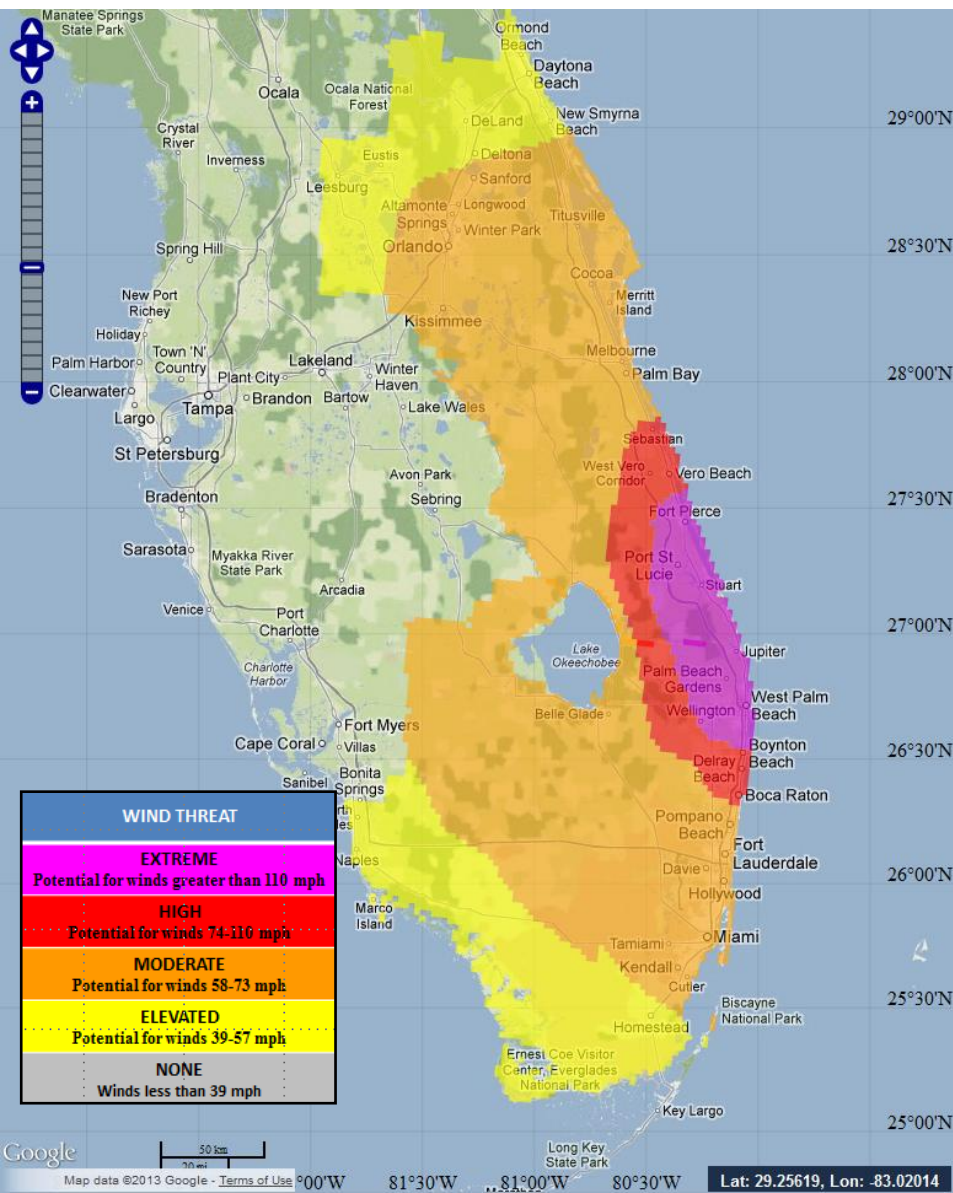
# Mosaics: *"The Bigger Picture"*



HTI is a good resource for state, regional, and national scale hurricane briefings (i.e. NWS ROCs and NOC) using mosaics.

HTI will also be included within the NDFD.

# Mosaics: "The Bigger Picture"



Wind Threat	Potential Wind Impacts
<b>EXTREME</b>  Threat for wind greater than 110 mph	<b>DEVASTATING TO CATASTROPHIC</b>  To be safe, aggressively prepare for the potential of devastating to catastrophic wind impacts from major hurricane force wind of equivalent Category 3 intensity or higher.
<b>HIGH</b>  Threat for wind 74-110 mph	<b>EXTENSIVE</b>  To be safe, aggressively prepare for the potential of extensive wind impacts from hurricane force wind of equivalent Category 1 or 2 intensity.
<b>MODERATE</b>  Threat for wind 58-73 mph	<b>SIGNIFICANT</b>  To be safe, earnestly prepare for the potential of significant wind impacts from strong tropical storm force wind.
<b>ELEVATED</b>  Threat for wind 39-57 mph	<b>LIMITED</b>  To be safe, prepare for the potential of limited wind impacts from tropical storm force wind.
<b>LITTLE TO NONE</b>  Wind less than 39 mph	<b>LITTLE TO NONE</b>  No immediate preparations needed; little to no wind impacts.



## East Central Florida - Hurricane Threats & Impacts

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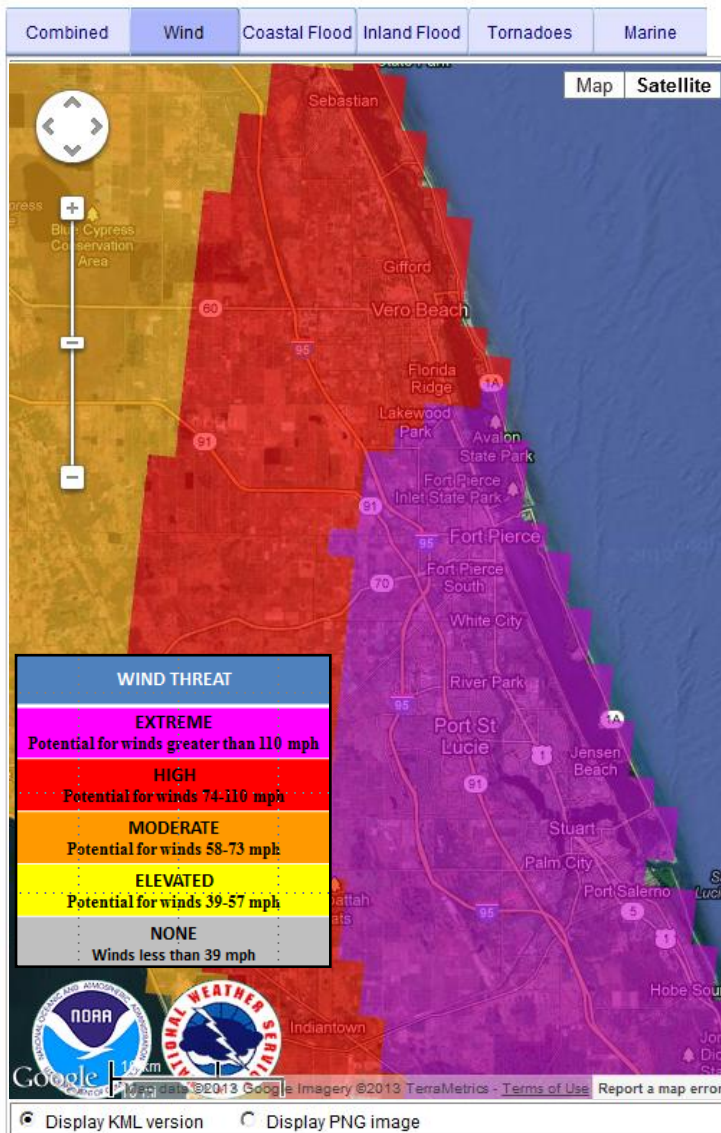
Search for:

NWS

All NOAA

Go

### Hurricane Omega



ZOOM

Prepare for These Potential Conditions:



## East Central Florida - Hurricane Threats & Impacts

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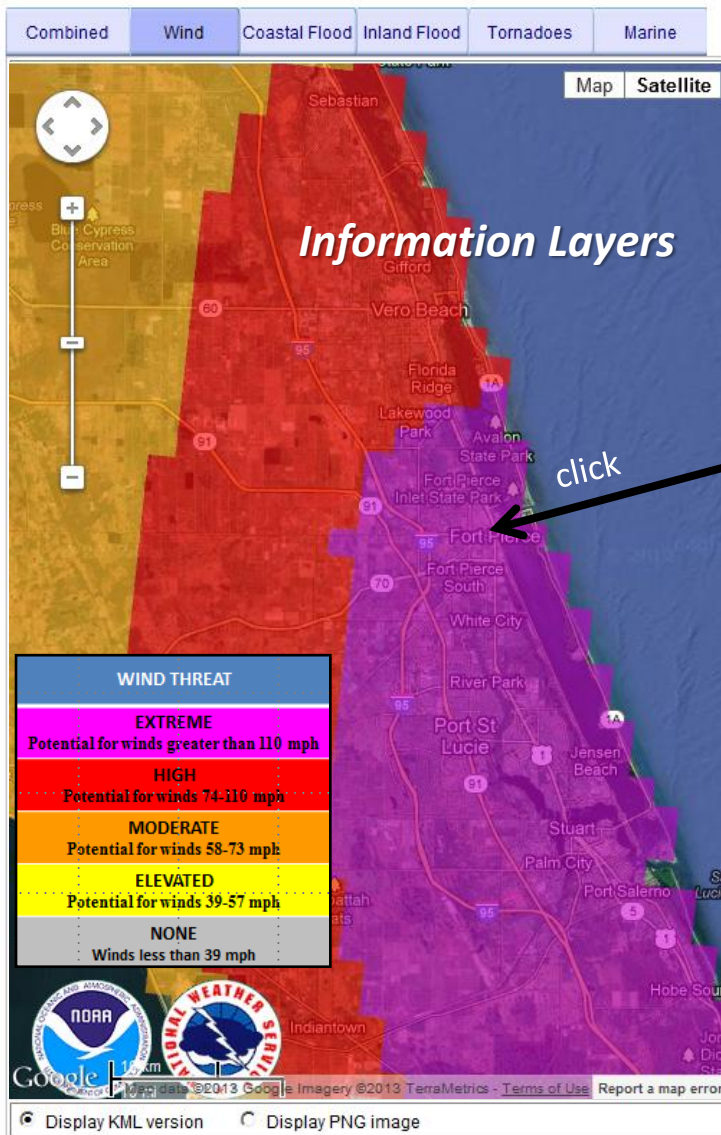
NWS



All NOAA

Go

### Hurricane Omega



ZOOM

Prepare for These Potential Impacts:

Wind Threat	Potential Wind Impacts (generalized)
<b>EXTREME THREAT</b> for wind greater than 110 mph	<b>DEVASTATING TO CATASTROPHIC IMPACTS</b>  <b>Potential Impact Statements with Local Detail</b>  For each Hazard; For each Level  By Forecast Area; By County/Zone

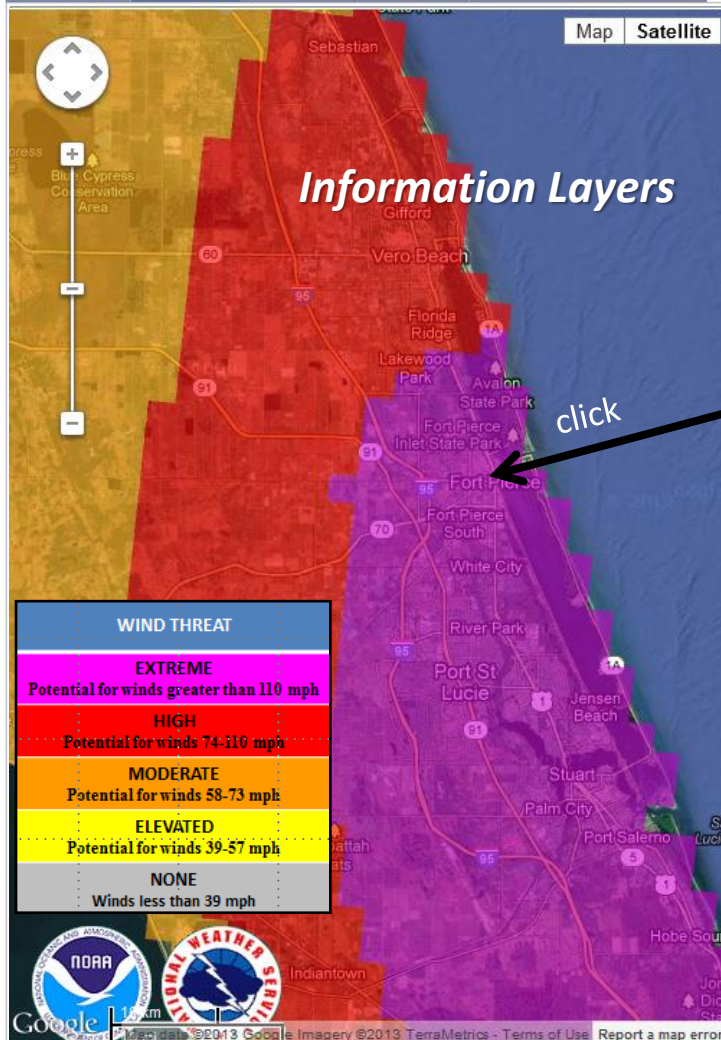
Also good for local hurricane briefings ... with added detail.



# East Central Florida - Hurricane Threats & Impacts

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## Hurricane Omega

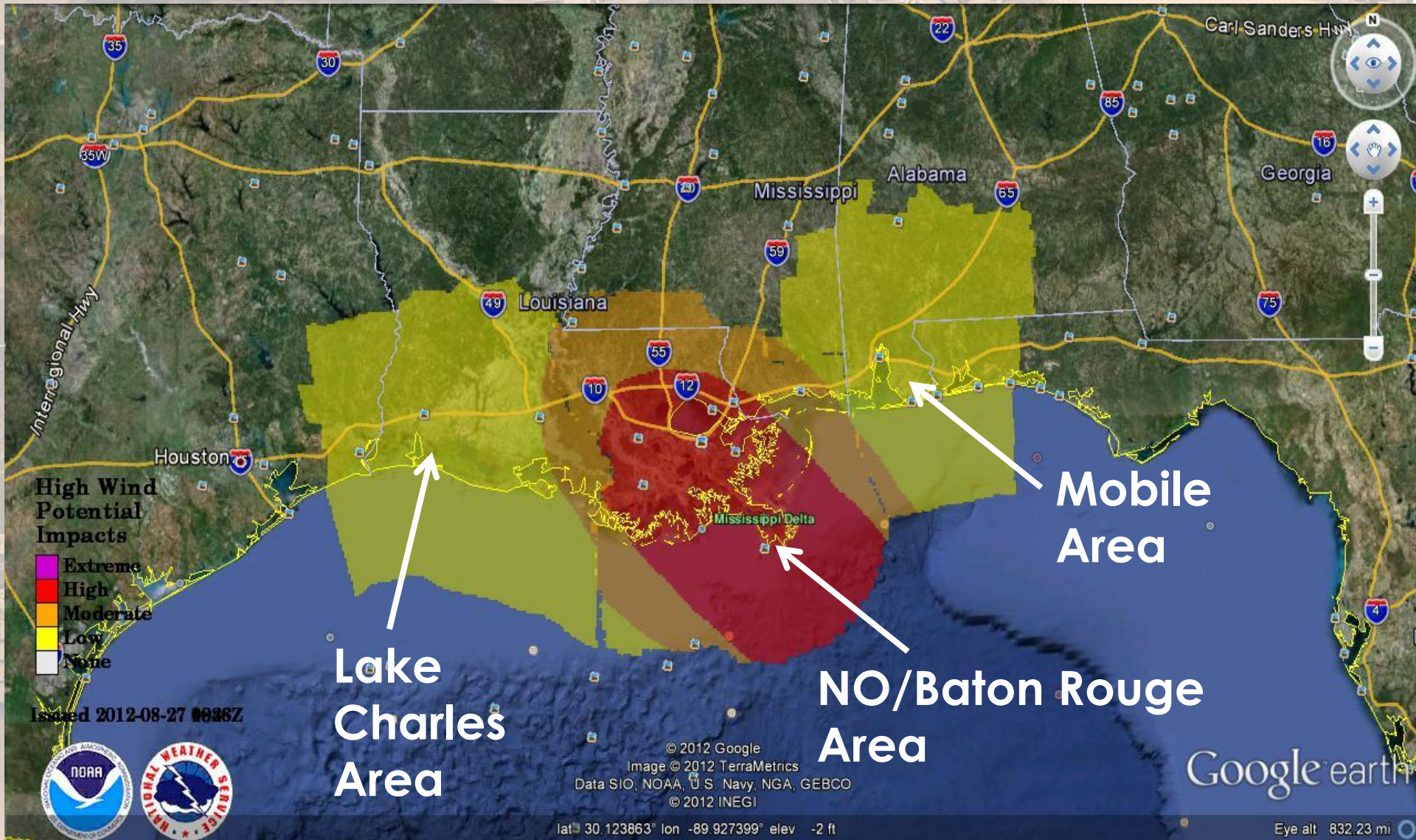
[Combined](#) [Wind](#) [Coastal Flood](#) [Inland Flood](#) [Tornadoes](#) [Marine](#)[Map](#) [Satellite](#)**ZOOM**

Prepare for These Potential Impacts:

Wind Threat	Potential Wind Impacts (generalized)
<b>EXTREME THREAT</b> for wind greater than 110 mph	<b>DEVASTATING TO CATASTROPHIC IMPACTS</b>
<b>Imperiled Lives</b>	<ul style="list-style-type: none"><li>To be safe, aggressively prepare for the potential of devastating to catastrophic wind impacts from major hurricane force wind of equivalent Category 3 intensity or greater.</li></ul>
<b>Buildings</b>	<ul style="list-style-type: none"><li>Life threatening wind possible. Failure to adequately shelter from extreme wind may result in serious injury, loss of life, or immense human suffering.</li></ul>
<b>Trees/Signs</b>	<ul style="list-style-type: none"><li>Structural damage to sturdy buildings with some experiencing complete roof and wall failures. Complete destruction of mobile homes. Damage greatly accentuated by large airborne projectiles. Hardest hit locations may be uninhabitable for weeks or months.</li></ul>
<b>Roads/Bridges</b>	<ul style="list-style-type: none"><li>Numerous large trees snapped or uprooted along with fences and roadway signs blown over.</li></ul>
<b>Power/Comms</b>	<ul style="list-style-type: none"><li>Many roads impassable from large debris. Many bridges, causeways, and access routes connecting barrier islands impassible.</li><li>Widespread power and communication outages with many areas suffering extended outages.</li></ul>

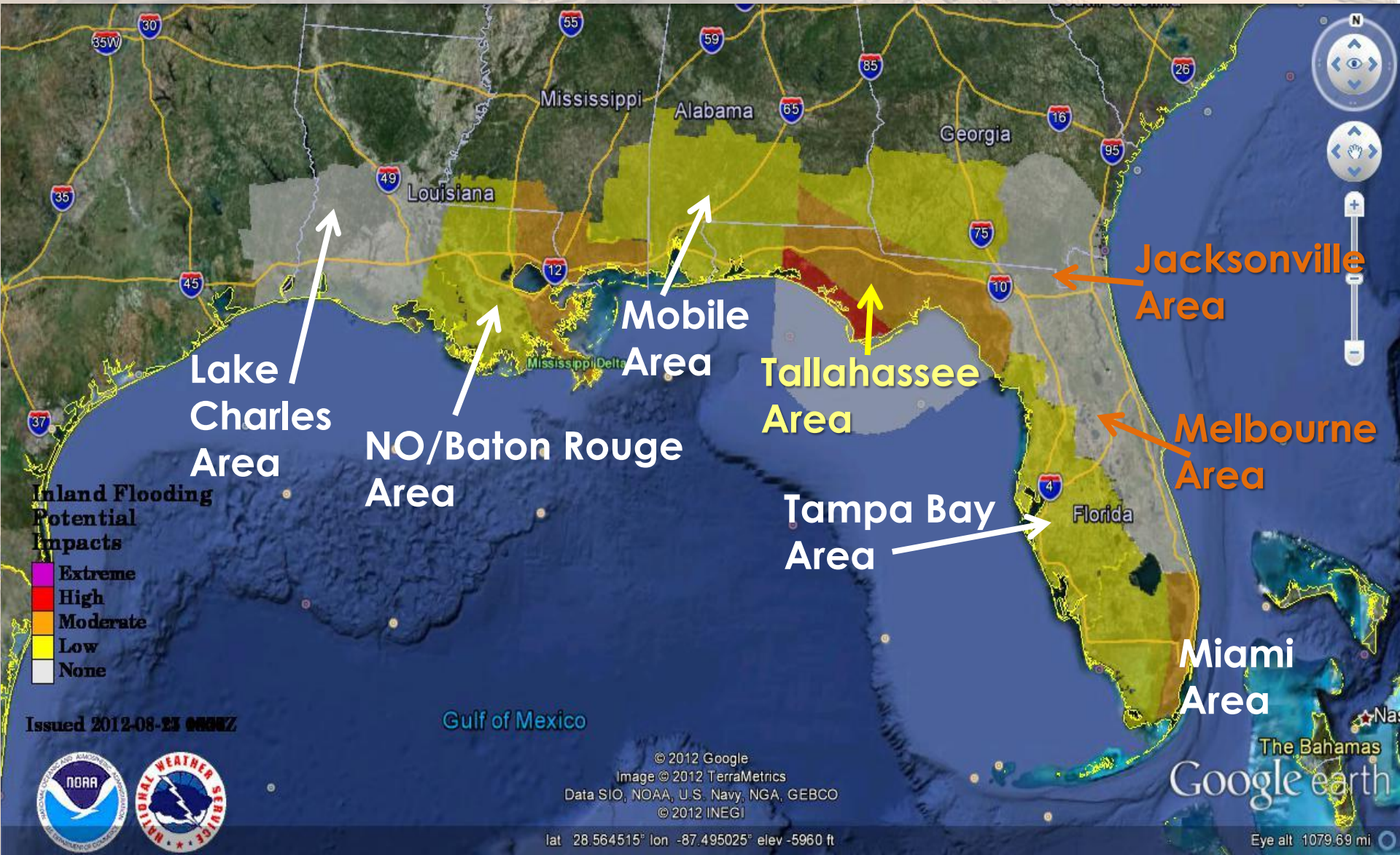
Also good for local hurricane briefings ... with added detail.

# Hurricane Threats and Impacts Mosaic: Isaac (Wind)



# Hurricane Threats and Impacts

## Mosaic: Isaac (Inland Flood)

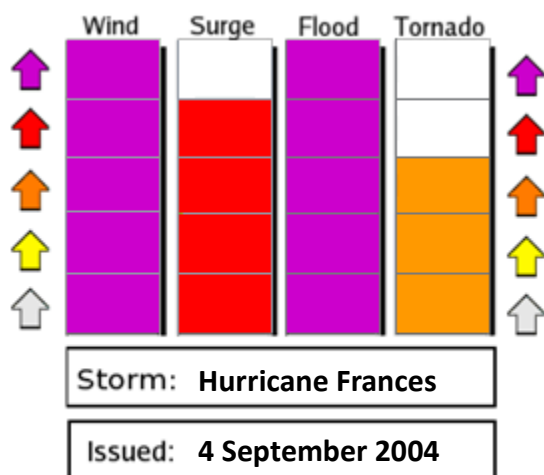




# All Hazards Assessments

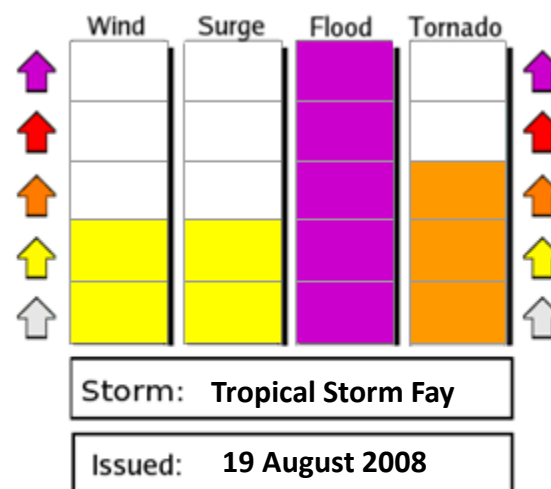
## Hurricane Frances - All Hazards

Saint Lucie County, FL



## Tropical Storm Fay - All Hazards

Lat/Lon 28.12N 80.62W



*"Emoticons"  
to help overcome  
language barriers?*



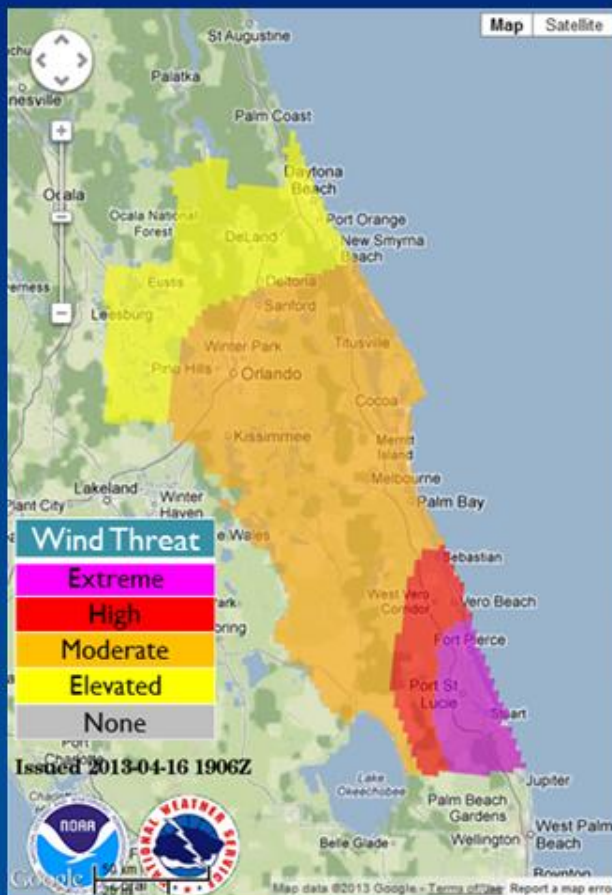
Community Distress Index



National Weather Service  
Melbourne, FL  
September 13, 2009 at 6:00 am

## Hurricane Omega

### Life-Threatening & Historic Winds Possible for Treasure Coast



- Hurricane Warnings are in effect for all of East Central Florida; dangerous winds may arrive as early as Saturday afternoon
- The wind threat is extreme for Martin and Saint Lucie Counties; a high wind threat for Indian River County
- All counties subject to at least a reasonable chance for tropical storm force wind

**To be safe, protect against the greatest threat of damaging wind as depicted for your area.**

<b>EXTREME THREAT</b> for wind greater than 110 mph
<b>HIGH THREAT</b> for wind 74-110 mph
<b>MODERATE THREAT</b> for wind 58-73 mph
<b>ELEVATED THREAT</b> for wind 39-57 mph
<b>LITTLE TO NO THREAT</b> wind less than 39 mph



# Salient Points About Hurricane Threats and Impacts

- Employs aspects of each step of the Decision Support Process.
- Local NWS offices exercise local expertise by downscaling and refining National Center forecasts hazard by hazard, and by making value-added edits.
- Uncertainty (Confidence) is objectively factored-in without angst, yielding responsible depictions of the **reasonable, worst case scenario**.
- Accompanying **potential impact statements** are accessed in layers and will be **customized locally**.

# Salient Points About Hurricane Threats and Impacts

- Serves as a rally point for helping to preserve a unified forecast message and springboard for proportional public safety messaging.
- Information is available in “*kml*” and “*png*” formats, with gridded data also available in NDFD.
- Addresses the desired strategic outcomes of Weather-Ready Nation for greater readiness, responsiveness, and resiliency to potential disasters, along with the cited goals for improved Decision Support Services provided by highly skilled forecasters.

# NWS Information During Recovery

- Information doesn't stop when the hurricane does
- Levels of access during recovery:
  - Corporate Level/Sub-level emergency management
  - Employees
  - Customers



# NWS Information During Recovery

- **Corporate/Sub Level Emergency Management**
  - Heads Up Emails (also employee share)
  - Webinars (also share as briefing)
  - NWSChat
  - Web Graphics (all)
  - Social Media (all)



# NWS Information During Recovery

- “Heads-Up” E-mails



Barry Goldsmith - NOAA Federal <barry.goldsmith@noaa.gov>

## **\*\*Weather Alert\*\* Heavy Rainfall for the Ranchlands/Upper Valley; Fog for the Coast; Possible Strong Storms for Lower Valley (Re-sent)**

5 messages

Barry Goldsmith - NOAA Federal <barry.goldsmith@noaa.gov>

Fri, Mar 20, 2015 at 1:18 PM

To: "sr-bro.em@noaa.gov" <sr-bro.em@noaa.gov>, sr-bro.media@noaa.gov

Cc: \_NWS SR BRO <sr-bro.all@noaa.gov>

Bcc: Joe Arellano <Joe.Arellano@noaa.gov>, John Metz <John.Metz@noaa.gov>, Jon Zeitler <Jon.Zeitler@noaa.gov>, Kenneth Graham <Kenneth.Graham@noaa.gov>, Mike Buchanan <mike.buchanan@noaa.gov>, Paul Yura <paul.yura@noaa.gov>, Roger Erickson <roger.erickson@noaa.gov>, Thomas Johnstone - NOAA Federal <thomas.johnstone@noaa.gov>



**Note: Re-transmitted with Subject Line! My apologies everyone...**

Good Friday Afternoon Everyone!

It's been awhile since we've had an array of potentially impactful weather, but such may be the case as we head through Saturday into early Sunday.

### The Skinny

Another in a series of upper level disturbances originating off the west Mexican coast will lift across Texas from late tonight through Saturday, sparking another round of locally heavy rainfall for the Rio Grande Plains and South Texas Brush Country overnight into Saturday. The rains will tend to taper down from west to east across the Rio Grande Valley (along/near the river from Starr through Cameron/Willacy) Saturday into Saturday evening, but there is a potential for a broken line of thunderstorms, some which could produce local downpours, wind, hail, and frequent lightning.



# NWS Information During Recovery

 Barry Goldsmith - NOAA Federal <barry.goldsmith@noaa.gov>

**\*\*Weather Alert\*\* Heavy Rainfall for the Ranchlands/Upper Valley; Fog for the Coast; Possible Strong Storms for Lower Valley (Re-send)**

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To: 'sr-brs em@noaa.gov' <sr-brs em@noaa.gov>, sr-brs mesa@noaa.gov  
Cc: 'NWS SR BRD' <sr-brs all@noaa.gov>  
Bcc: Joe Avallaro <joe.avallaro@noaa.gov>, John Metz <john.metz@noaa.gov>, Jon Zettler <jon.zettler@noaa.gov>, Kenneth Graham <kenneth.graham@noaa.gov>, Mike Buchanan <mike.buchanan@noaa.gov>, Paul Yura <paul.yura@noaa.gov>, Roger Erickson <roger.erickson@noaa.gov>, Thomas Johnstone - NOAA Federal <thomas.johnstone@noaa.gov>

Fri, Mar 20, 2015 at 1:18 PM



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**Another Wet Pattern In an already Wet March**



Above: Satellite photo at 1115 AM March 20th, showing tropical moisture from the Pacific (dark green arrow) surging north into west Texas, aided by upper level low near Baja. Lower level moisture (light green arrow) will assist the deeper moisture to provide locally heavy rainfall, particularly for the Rio Grande Plains and Brush Country ranchlands as the upper system tracks through northern Mexico and west Texas.

**What to Watch For**  
Description of the hazard/threat, including key times and location of potential impact. Here's where you would include graphics (GPF, graphiccasts, etc) to help clarify the situation.

- Rain.** Heaviest amounts, 1 to 3 inches but locally 4 inches or higher, from Zapata through Jim Hogg and northern Brooks. Combined with heavy rainfall from March 17th, some areas may see 6-7 inches for the week, which would be 3 times the monthly average alone. Timing of heaviest: Midnight through before Saturday.
- Fog.** Dense fog has plagued the coastline and kept Spring Break crowds down this year. Visibility will drop to near zero at the beach between 6 and 9 PM, and could dip to 1/4 mile or less after midnight farther inland, including the Raymondville-Harlingen-San Benito-Brownsville area. This dense fog would continue through 9 AM Saturday. Another round is expected behind any rains Saturday afternoon/evening - forming by midnight Sunday and continuing through 9 or 10 AM Sunday.
- Storms.** Thunder will accompany the rain overnight and Saturday, though everyone won't see/hear it. The best opportunity for gusty winds (40 to 50 mph) and small hail (dime size or less) is between 4 and 10 PM Saturday from Highway 281 to the coast in the Rio Grande Valley.

**Potential Impacts/Recommended Actions**

- Flooding**
  - Flood drainage locations in Falfurrias, Hebbronville, Roma, and Zapata are at risk for 1-3 feet of standing or flowing water
  - Overnight/early morning drivers should be aware of typical flood prone areas, and avoid driving near them
  - Arroyos/creeks that remain high from the early week rains could reach or briefly exceed bankfull late tonight and early Saturday.
  - People are encouraged to avoid fast flowing arroyos or streams, even just below bankfull.
  - High water in ranchlands of Jim Hogg, Zapata, and northeastern Brooks County could reach 3 feet in some spots which could become an issue for cattle
  - Ranchers with 1-2 feet of standing water on fields may wish to move herds to higher ground **through this evening**.
- Fog**
  - Driving will continue to be difficult where dense fog settles; Spring Break weekend (and weekend in general) brings more people out and potentially in harm's way from midnight to 3 AM each night
  - Slow down, maintain safe distance between vehicles, be sure tires/wipers ready for rain. "Visibility and traction leave time for reaction"
  - Boaters in the Gulf waters out to 20 miles out remain in continuous "pea soup" and conditions will remain dangerous - near zero visibility - through at least noon on Sunday. Only break would be from rain showers which would temporarily "dent" the fog

- “Heads-Up” E-mails
  - Provide Plain-Language Overview of Situation
  - Focus on Event, Impact, Action
  - Can be Shared with Entire Staff(s)

# NWS Information During Recovery

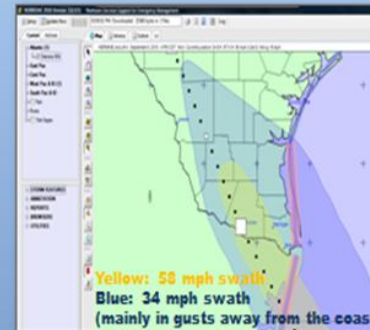
## • Webinars

### Tropical Storm Hermine 4/430 PM Briefing Slides

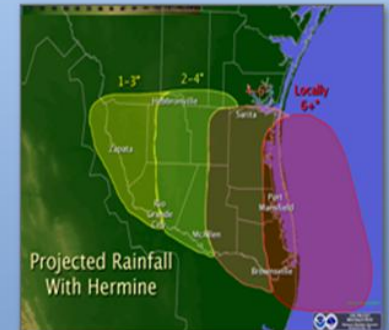
1



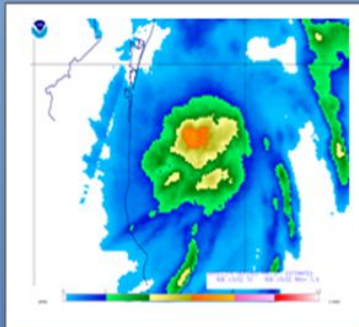
2



3



4



5

### Potential Impacts

- Inland Flooding:
  - 4 to 8 inches of rain, locally 12 inches or more
  - Track and duration DO NOT suggest similar River Flood situation to Alex/TD #2
  - But slightly further west track may cause some issues in sensitive areas west of improved levees later this week
  - Poor drainage areas at most risk
- Wind
  - Most likely: Brief period sustained 39 to 43 mph near the coast (Los Fresnos-Port Isabel-SP) just 60 mph 10 PM – 2 AM
  - Only in core of cyclone as it passes within 30 to 60 miles of coast
  - Gusts to 50 mph or higher McAllen-Falfurrias eastward
  - McAllen-Midburg: 10 PM – 2 AM
  - Raymondville: 11 PM – 3 AM
  - Falfurrias: 1 AM – 5 AM Tuesday

6

### Potential Impacts

- Storm Surge/Tide
  - 2 to 2.5 feet above predicted 10 PM to 2 AM
  - Water into dunes at across Beach Access openings Andy Bowie northward
  - Flooding similar to what area had with Alex, perhaps a little bit more
- Tornado
  - Low threat; could see "spinners" in Lower Valley through 9 PM and upper valley/brush country through midnight
  - Could produce 60 mph gusts far from center of storm

7

### Potential Impacts - Flood



8

### Potential Impacts: Wind



Note: Could drop back to low near coast

### Potential Impacts: Storm Surge/Tide

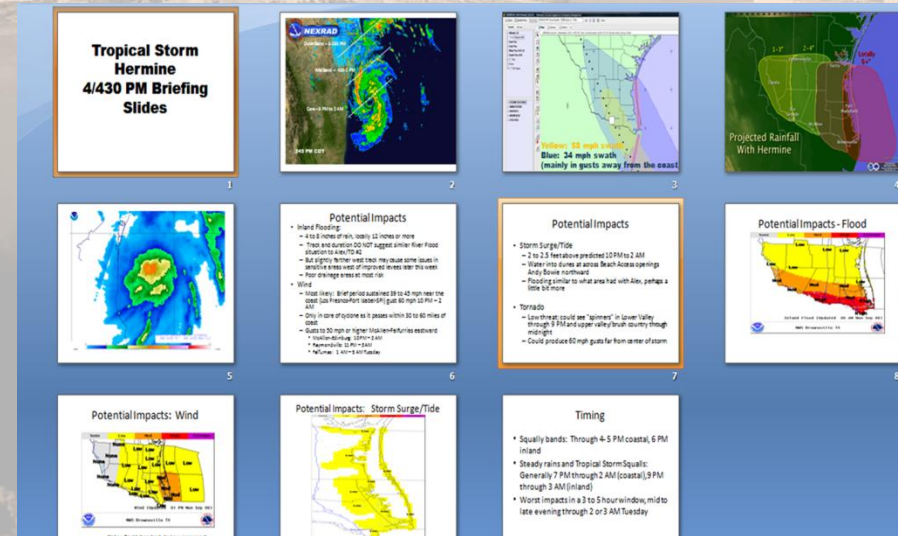


### Timing

- Squally bands: Through 4-5 PM coastal, 6 PM inland
- Steady rains and Tropical Storm Squalls: Generally 7 PM through 2 AM (coastal), 9 PM through 3 AM (inland)
- Worst impacts in a 3 to 5 hour window, mid to late evening through 2 or 3 AM Tuesday

# NWS Information During Recovery

- Webinars
  - Higher level of concern
  - Allows for Thousands to listen at once (hundreds signed in, dozens in conference rooms)
- Can be re-posted as web briefings
  - Examples: Widespread heavy rainfall
  - Squall lines
  - Extreme heat/humidity



# NWS Information During Recovery

- NWSChat (EM Only)

fwdchat@conference.nwschat.weather.gov

Conversation Options Send To

chat.noaa.gov x noreply@nwschat.weather.gov/noreply x fwddchat@conference.nwschat.weather.gov x brochat@conference.nwschat.weather.gov x

fwddchat@conference.nwschat.weather.gov  
WFO FWD Chat

[2/11/2010 2:14:36 PM] nwsbot: FWD issues [Public Information Statement \(PINS\)](#) ... 2009-2010 WINTER AMONG SNOWIEST ON RECORD ...

[2/11/2010 2:15:30 PM] nwsbot: FWD: 3 Ne Keller [Tarrant Co, TX] nws employee [reports SNOW of E6.50 INCH](#) at 02:13 PM CST --

[2/11/2010 2:16:28 PM] media-roger.barry: Thanks Bill... that explains it.

[2/11/2010 2:17:01 PM] nwsbot: FWD: Mckinney [Collin Co, TX] public [reports SNOW of E5.00 INCH](#) at 02:15 PM CST -- report of 5 inches in mckinney

[2/11/2010 2:19:25 PM] wfaa-1: do you have a 2pm snow total from dfw? thanks.

[2/11/2010 2:19:52 PM] nwsfwd-comms2: [5.7 through 2 pm at DFW](#)

[2/11/2010 2:20:04 PM] wfaa-1: thanks again 😊

[2/11/2010 2:20:18 PM] nwsbot: FWD: Keller [Tarrant Co, TX] nws employee [reports SNOW of E6.50 INCH](#) at 02:00 PM CST -- nws met reports 6.5 inches in north fort worth

[2/11/2010 2:22:29 PM] NWSsrh-rdo: FWD - FYI... We just had one of the SRH employees call in and report that they saw several large branches down between downtown and the northern part of the city due to the weight of the snow.

[2/11/2010 2:22:31 PM] media-david.finfrock: 4" now in Cedar Hill

[2/11/2010 2:23:07 PM] nwsfwd-comms2: [Thanks, David. Will send that report out.](#)

[2:24:38 PM] media-steve.c.lanore: FWD: Measured 5" at studios in Sherman 1410CST...FYI

[2:25:48 PM] nwsbot: FWD: 5 Sw Duncanville [Dallas Co, TX] broadcast media [reports SNOW of E4.00 INCH](#) at 02:23 PM CST -- reported in cedar hill.

[2:27:08 PM] nwsbot: FWD: Sherman [Grayson Co, TX] broadcast media [reports SNOW of M5.00 INCH](#) at 02:26 PM CST --

[2:27:16 PM] nwsfwd-comms2: [Thanks, Steve.](#)

[2:29:20 PM] nwsbot: FWD: Non-NWS Report -- from SpotterNetwork (unverified) @ 02:26 PM CST -- (S) Other -- -- Spotter is 1 miles NW of Saginaw, TX (Tarrant county) [32.865/-97.371] -- Measured with ruler several places Got avg of 7 to 6.50 inches and snow still falling Temp 32 to 33. (SN#4968)

[2:37:32 PM] media-larry.r.mowry: 8.5" in Justin

[2:38:15 PM] nwsfwd-comms2: [Thanks, Larry. LSR with that report coming out shortly.](#)

[2:39:30 PM] nwsbot: FWD: Justin [Denton Co, TX] broadcast media [reports SNOW of M8.50 INCH](#) at 02:38 PM CST --

[2:43:19 PM] nwsbot: FWD: Non-NWS Report -- from SpotterNetwork (unverified) @ 02:40 PM CST -- (S) Other -- -- Spotter is 4 miles SE of Avondale, TX (Tarrant county) [32.928/-97.381] -- 7" snow measured on elevated surface (diving board). Thin limbs beginning to bend and break. (SN#4969)

[2:43:24 PM] nwsbot: FWD issues [Graphicast](#)

[2:44:51 PM] nwsbot: FWD issues [Graphicast](#)

[2:44:58 PM] nwsbot: FWD: Bryson [Jack Co, TX] emergency mngr [reports SNOW of M9.00 INCH](#) at 02:43 PM CST --

[2:45:26 PM] nwsbot: FWD issues [Graphicast](#)

[2:45:44 PM] KVII-TV - Steve Kersh left the room.

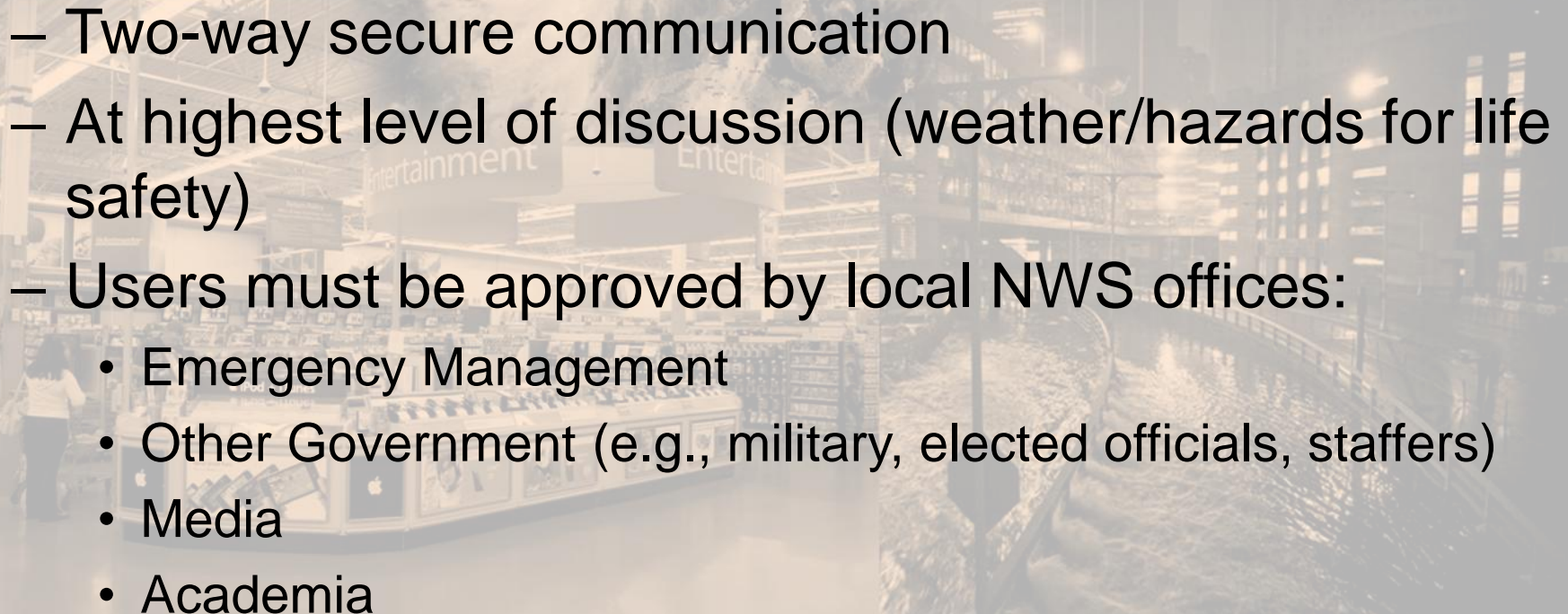
[2:47:13 PM] media-ken.johnson left the room.

57 people in room

- media-gary.england
- media-grant.dade
- media-larry.r.mowry
- media-lon.curtis
- media-matt.ernst
- media-matt.hines
- media-morgan.palmer
- media-olga.breese
- media-richard.jacks
- media-sam.nichols
- media-scott.chesner
- media-steve.c.lanore
- NSNGO-Tarrant-Guthrie
- NWS SHV Lead Forecas...
- NWS SHV WCM
- nws-alan.e.gerard
- nws-barry.goldsmith
- nwsfwd
- nws-greg.story
- nwsoun-wcm
- nwsjit-long term
- NWSsrh-rdo
- nws-tsa25
- nwsfwd-cwsu-reno

Font Insert Smile!

- NWSChat



# NWS Information During Recovery

- Weather-at-a-Glance



## ***Strong Winds Late Tonight And Early Friday***

National Weather Service, Norman, OK

### ***Arrival time of strong winds:***

**Midnight to 3 am**

**3 am – 6 am**

**6 am – 9 am**

***Wind Speed Gusts:*** North at  
40 - 45 mph

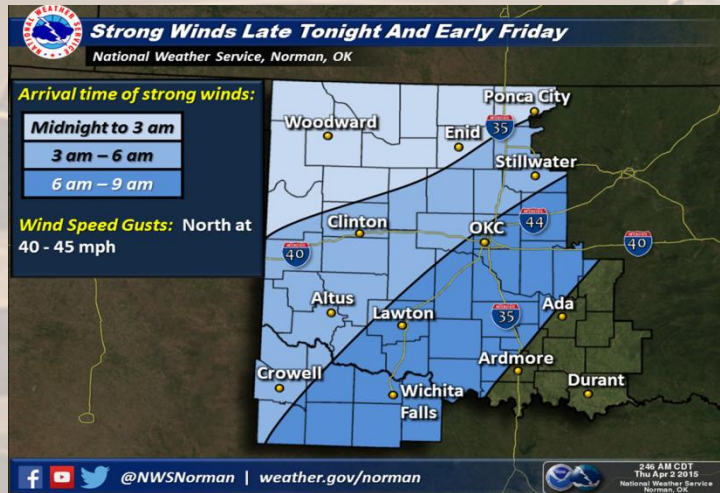


@NWSNorman | [weather.gov/norman](http://weather.gov/norman)



246 AM CDT  
Thu Apr 2 2015  
National Weather Service  
Norman, OK

# NWS Information During Recovery



- **Weather-at-a-Glance**

- Provides Quick Look at Potential Hazards
- Example Shown: Wind Speed and Timing
- Often Include Potential Impact

- In this case: What might 40-45 mph wind do to your business?

- Public-Facing...all can see and use

# NWS Information During Recovery

## • Social Media



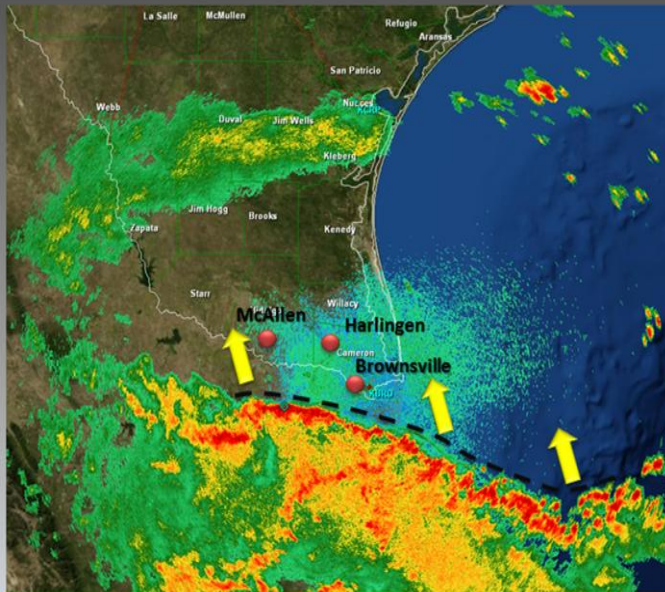
### Heads Up RGV!

#### What to Expect

- Moderate to heavy downpours
- Occasional Lightning
- Strong gusty winds

#### Impacts

1. Reduced visibilities
2. Ponding on roads
3. Localized flooding
4. Loose outdoor items may blow around



Radar Image: 12:39pm - September 13, 2014

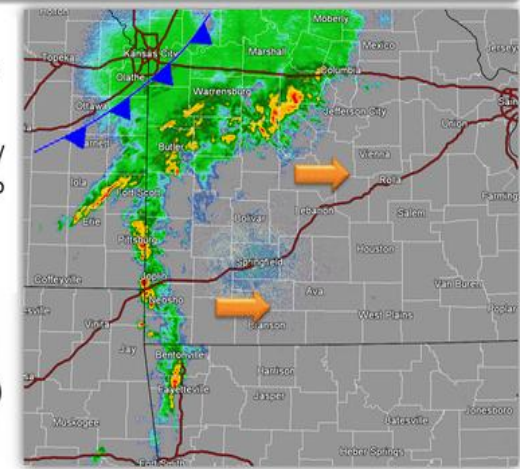


National Weather Service  
Springfield, Missouri

### Scattered Showers & Storms This Morning

Scattered Showers & Storms this Morning as Cold Front approaches.

A Few Strong Storms w/ small hail, wind gusts to 35 mph & frequent lightning.



[www.weather.gov/springfield/?n=hwo](http://www.weather.gov/springfield/?n=hwo)

Radar: 7 AM

Published on: 04/02/2015 at 7:10AM



NWS Springfield @NWSSpringfield · 3h

Scattered showers & storms increasing this morning as a front approaches. #mowx #kswx

7 2



# NWS Information During Recovery

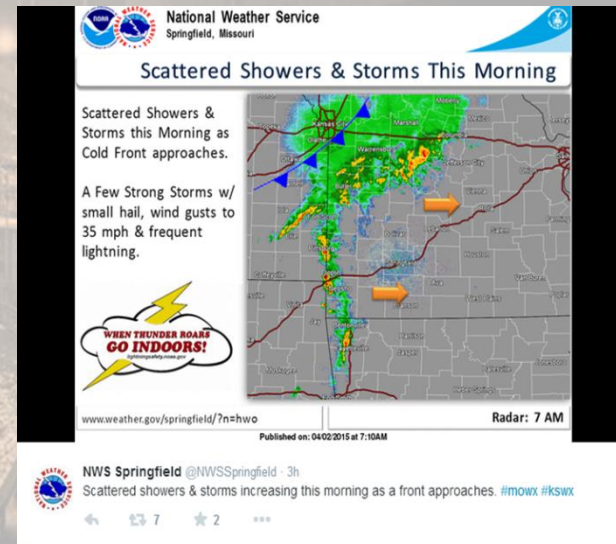
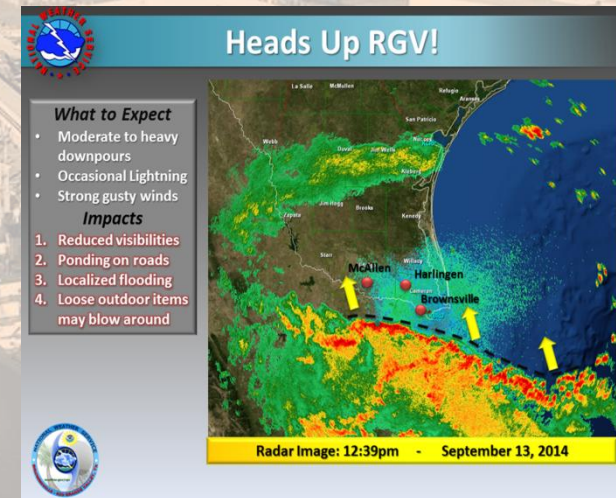
- **Social Media**

- **Facebook**

- Two-way conversation
    - Effective prior to and after weather event
    - Viral sharing can help spread message quickly and explode additional conversations
    - Caution: Only seen by a fraction of intended users

- **Twitter**

- “Breaking News”
    - Effective during weather event
    - Seen by all followers...
    - ...but must be “scanning” the feed



# Questions? Thank You!

**Contact:**

**Barry S. Goldsmith**

**[barry.goldsmith@noaa.gov](mailto:barry.goldsmith@noaa.gov)**

**956-572-1492**

**<http://weather.gov/rgv>**



**Weather-Ready Nation**

National Oceanic and Atmospheric Administration